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BERYLLIUM AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

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CONTENTS

INTRODUCTION 1

ANNOTATED BIBLIOGRAPHY

Emission Sources 3

Atmospheric Interaction 9

Measurement Methods 15

Control Methods 29

Effects - Human Health 35

Effects - Plants and Livestock 53

Standards and Criteria 55

Basic Science and Technology 59

AUTHOR INDEX 63

TITLE INDEX 67

SUBJECT INDEX. 71

GEOGRAPHIC LOCATION INDEX 75

United States (States, Cities). 75

Foreign (Countries, Cities) 75

BERYLLIUM AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

INTRODUCTION

This bibliography contains 107 abstracts of documents and articles on beryllium. These abstracts are numbered sequentially on their upper right corner. The number on the upper left corner is the APTIC accession number.

An author index, a title index, a subject index, and a geographical location index follow the abstracts. The author index lists all authors individually. The first author is indicated by an asterisk (*). The indexes refer to the abstracts by the number on their upper right corner.

All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, Air Pollution Control Office, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27709. Readers outside the Air Pollution Control Office (APCO) may seek duplicates of documents directly from libraries, publishers, or authors.

EMISSION SOURCES

04212 1

S. Abe

THE PRESENT STATUS OF AIR POLLUTION. Clean Air Heat Management (Tokyo) 15, (7-8) 7-18, Aug. 1966. Jap.

The present status of air pollution in Japan is given naming the kinds of contaminants and their origin, factors affecting contamination density, and various types of smog. The types of contaminants are: 1) minute particles (less than 1 micron in size) such as found in soot, carbon, ashes, dust; 2) coarse particles (greater than 1 micron in size), as found in dust, ashes, and minerals; 3) reactive substances found in mist, fog, and vapor such as SO_2, SO_3, H_2S, CO_2, CO, NO_2, N_2O_3, O_3, aldehydes, HCl, NH_3, HF, Pb, Hg, Cd, As, Be and 3, 4-benzpyrene. The contaminants originate from factories, chemical plants, power stations, domestic heating, public baths, hotels, laundries, dry cleaning establishments, hospitals, schools, and public buildings. Also discussed are the human factors affecting air pollution such as public awareness and interest, seasonal, weekly, and daily changes in heating and cooking. Meteorological aspects are covered such as wind direction and velocity, turbulence, temperature, rain and snow. The types of smog found in New York, London, Los Angeles, Pittsburgh, and Yokkaichi are described. Graphs and tables list symptoms and diseases affecting plants and humans and give the density of dust particles and SO_2 in the main cities of Japan. Data on the sulfur content of various oils produced by Japanese refineries and on the number of Japanese automobiles produced is included for information on emission sources of pollutants.##

00081 2

R.T. Arnest

ATMOSPHERE CONTROL IN CLOSED SPACE ENVIRONMENT (SUBMARINE). Naval Medical Research Lab., New London, Conn., Bureau of Medicine and Surgery, (Rept. No. 367.) Dec. 14, 1961. 39 pp.
CFSTI, DDC: AD 270896

The purpose of this work was to make a general summary of the toxicological problems associated with the closed space environment of submarines and to review the current state of development of tools for measuring and removing the problem substances involved. More than twenty-five atmospheric contaminants are listed, their sources, and their maximum allowable concentrations (MAC) are given, as well as the symptoms they cause, the long-term effects;

Preceding page blank

tools for measuring the amounts of contaminants present are described and methods of removal indicated, in so far as known.##

03110 3

J. L. Blumenthal M. J. Santy

AN EXPERIMENTAL INVESTIGATION OF THE BEHAVIOR OF BERYLLIUM METAL IN SIMULATED LAUNCH PAD ABORT ENVIRONMENTS. Sandia Corp., Albuquerque, N. Mex. July 1965. 219 pp.

The experimental investigations of the reaction kinetics and flame environment reactions of beryllium are reported. Experiments were conducted using seven combustion gas species (O_2, N_2, H_2O, H_2, NO, CO, and CO_2) to determine the rate of release of airborne beryllium or its compounds in the event of a catastrophic launch pad accident. Beryllium heated to 2400 F in an environment of water vapor in combination with oxygen will ignite and burn with a release of large amounts of beryllium oxide smoke. (Author abstract)##

20587 4

Durocher, Norman L.

PRELIMINARY AIR POLLUTION SURVEY OF BERYLLIUM AND ITS COMPOUNDS: A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., Contract PH 22-68-25, NAPCA Pub. APTD 69-29, 79p. Oct. 1969. 71 refs.
CFSTI: PB 188078

Beryllium is among the most hazardous and toxic of the nonradioactive substances being used in industry. Soluble beryllium compounds, such as beryllium sulfate and beryllium chloride, commonly produce acute pneumonitis; insoluble compounds, such as metallic beryllium and beryllium oxide, produce chronic pulmonary disease (berylliosis). However, the toxic effect of beryllium is not limited to pulmonary damage; it can cause body-wide systemic disease. Some beryllium in soils is toxic to plant life. No evidence is available of the effects of atmospheric beryllium on plants or materials. The increased use of beryllium in the metallurgical industry, along with its proposed use as a high-energy fuel for rocket motors, suggests that a study be made of the air pollution aspects of the material. Limited data on environmental air concentrations indicate that daily average values are less than 0.0005 micrograms/cu m, with maximum values of 0.008 micrograms/cu m. Concentrations in the vicinity of a large beryllium plant can range from 0.0281 micrograms/cu m to 0.0827 micrograms/cu m. Both in-plant and out-of-plant emissions are effectively reduced by conventional air-cleaning devices. A list of these devices and their expected efficiency is included. Current control practices limit worker exposure to beryllium dust to about 2 micrograms/cu m or less. The costs of beryllium air-pollution abatement can exceed $13,000 per year; but, in many instances, the cost is offset by the recovery of valuable materials.

00080 5

J.B. Goldmann

BERYLLIUM, A SURVEY OF THE LITERATURE. Lockheed Missiles and Space Division, Lockheed Aircraft Corp., Sunnyvale, Calif. (Special Bibliography SB-61-35) June 1961. 101 pp.
CFSTI, DDC: AD 263272

This bibliography covers publications released during the first quarter of 1961. Citations are arranged alphabetically by author under broad subject headings of Alloys; Analysis; Applications; Bibliographies; Compounds; Fabrication Techniques; Hazards; Joining; Oxides; Powder Metallurgy and Casting; Processing; Properties; and Miscellaneous. In addition to the current acquisitions of the 6ockheed Missiles and Space Division Technical nformation Centerand certain specialized journals, the following sources were surveyed: ASM Review of Metal Literature; ASTIA Technical Abstract Bulletin; Abstracts Journal of Metallurgy, Parts A and B, (USSR); Acta Crystallographica; Battelle Technical Review; Chemical Abstracts; Crerar Metals Abstracts; Defense Metals 2nformation Center, Selected Accessions; Engineering Index; Journal of Less Common Metals; Metallurgical Asbracts (Institute of Metals); Nuclear Engineering Abstracts; Nuclear Science Abstracts; Radiation Effects Information Center, Accession Lists; Science Abstracts, A: Physics; Soviet Journal of Non-Ferrous Metals; Soviet Physics-Crystallography; Soviet Science in Translation; U.S. Government Research Reports.##

07322 6

Hara, N., A. Hamada, K. Nozaki, and H. Sakabe

BERYLLIUM CONCENTRATION IN THE AIR OF BERYLLIUM ALLOY HANDLING FACTORY. Text in Japanese. Bull. Nat. Inst. Indust. Health (Kawasaki, Japan), (1):54-9, 1958.

A report is made on an investigation carried out in a beryllium alloy handling factory in places where the alloy is cut and where vacuum scorification tkaes place. One of the alloys cut contained 40% beryllium and the other 20%. A large size a-c type electrostatic percipitator and a filtration type dust collector were used. The concentrations of beryllium measured in the air were 0.58 to 1.41 gamma/cu m at the point of scorification. The hourly variations of concentration at various places in the factory are tabulated. Diagrams of plant layout are included.##

02453 7

L.C. Herwig, Jr. F.B. Higgins, Jr.

MONITORING OF ENVIRONMENTAL DISPERSION OF BERYLLIUM FROM DISPOSAL OF A SOLID PROPELLANT BY TRENCH BURNING AT DUGWAY PROVING GROUND, UTAH. Army Environmental Hygiene Agency, Edgewood Arsenal, Md. 1965. 73 pp.

A study of diffusion of beryllium from disposal of a solid propellant waste was conducted at Dugway Proving Ground, Utah, during June-July 1965. The propellant waste was burned in two open trenches in a canyon previously designated as a disposal area at the base of Granite Mountain on the west range of the Proving Ground. Air Sampling was accomplished by use of several types of high volume air samplers. Some soil sampling was also conducted. The study was designed primarily to determine the distribution of beryllium to the environment. Once this was accomplished, it became possible to evaluate this site as a disposal area, and to make recommendations as to the extent of sampling and precautionary measures to be taken if the site were to be used in the future for this type of disposal. Results indicate that while beryllium concentrations are high at the disposal site following ignition of the waste, they fall off rapidly with time and distance. The study shows that large quantities of beryllium-containing solid propellant can be safely burned at Dunway Proving Ground with minimum hazard to civilian communities or to military personnel involved in the disposal effort provided specific meteorological conditions prevail. It is emphasized that this can be accomplished at Dugway Proving Ground because of the uniqueness of the terrain and the vast meteorological measurement capability that is readily available. (Author abstract)##

00066 8

R McGill

BERYLLIUM, ACTUAL AND POTENTIAL RESOURCES, TOXICITY, AND PROPERTIES IN RELATION TO ITS USE IN PROPELLANTS AND EXPLOSIVES. Naval Ordnance Lab., Silver Spring, Md., Chemistry Research Dept. (Rept. NAVWEPS 7346.) March 1961. 39 pp.
CFSTI: AD 253297

The objectives of this report are provision of information about the actual and potential supplu of Be and about the toxicology of Be and its compounds. Metallic Be will not be available in quantity if nothing better than the primitive methods of mining now in use, utilization of only the richest ores, and complex and inefficient methods of extracting BeO do not make way for better methods. If mining and extraction of Be are not improved, plans should not be mde to use more than small quantities of Be in explosives or in propellants. Six hundred short tons of Be are considered to be the total available domestic supply until mining and metallurgical methods have been improved. The ratio of domestic to foreign potentially available Be has been assumed to be 1:14. Therefore, the total foreign resources are about 10,000 short tons of Be. There are relatively vast quantities of Be in the U.S. in low grade ores, containing at least 0.1% beryl, estimated to contain 280,333 tons of beryl. If economical means of recovering Be from these sources are developed, much more pretentious plans for use of Be in explosives and propellants can be justified. Discovery of an acid leachable ore of considerable magnitude would lead to the same result. Portection against the toxic effects of Be during manufacturing processes can be achieved by good ventilation of working places, rigorous screening of exhaust gases, and conformation to the highest standards of personal hygiene. The toxic hazards of underwater evaluation of Ve explosives are believed to be negligible. Air blast evaluation of Be explosives are believed to be negligible. Air blast evaluation of Be explosives should be performed in isolated areas where re-entrance is prohibited until the Be concentration in the air is less than one microgram per cubic meter.##

13138

9

Noshkin, Victor E.

FALLOUT RADIONUCLIDES AND BERYLLIUM-7 IN OVER-OCEAN AEROSOLS. Tellus, 21(3):414-428, 1969. 19 refs.

Aerosols in surface air over the Atlantic Ocean were collected on air filters for several months during each year from 1964 to 1966. Measurement of the radioactivity in these filters was by gamma-ray spectrometry, and the concentration of various fallout nuclides and Be-7 was determined by computer analysis of the spectra. Results showed fallout radioisotope concentrations equal to or slightly less than the averages for over-land concentrations in the latitude band 0 to 40 deg N. When averaged by 10 deg latitude bands, month to month comparisons show significant differences in fallout concentrations over-ocean from those over-land. Less fallout was found in the 20 to 30 deg N latitude band with a correspondingly higher concentration in the 0 to 10 deg N band. Correlations of Be-7 to Cs-137 suggest that some Be-7 observed in marine aerosols may be stratospherically derived. The conclusion reached from the data was that over-land and over-ocean deposition at the same latitudes are different and are governed by independent meteorological events not necessarily operative on an annual cycle. No fractionation was observed between Cs-137 and Ce-144, in over-land and over-ocean aerosols as a function of latitude. The source for the fallout over-land and over-ocean must be the same well-mixed reservoir. (Author summary modified)

11095

10

Venezia, Ronald A.

CONTROL OF AIR POLLUTION FROM FEDERAL FACILITIES. Preprint, Public Health Service, Washington, D. C., National Center for Air Pollution Control, 15p., 1968. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-28, 1968, Paper 68-176.)

It is the Federal Government's intent to be exemplary in controlling air pollutant emissions from its facilities. The basic documents used are the Clean Air Act, Executive Order 11282, and regulations pursuant to it, and BOB Circular A-78. Most regulations cover all Federal Facilities located in the United States and certain possessions, making distinction in some methods of refuse disposal between urban and rural areas. Other regulations are specific for certain metropolitan areas with extensive air pollution problems. Each agency has surveyed its facilities to define the air pollution problem and solutions have been proposed to be implemented in a Government-wide 5-year program. This program is subject to updating and review each year. (Author's abstract)##

00486 11

J. F. Zielinski

ANALYSES OF FACTORS IN BERYLLIUM ASSOCIATED DISEASES. The Brush Beryllium Company, Cleveland, Ohio. Feb. 21, 1962. 45 pp.

The positive influence of the physical environments on the incidence of acute and chronic occupational diseases in an occupational population at risk, and of the chronic type of disease in a nonoccupational population at risk has been demonstrated. An attempt was made to clarify the two principal classes of beryllium associated diseases. The magnitude of pollution levels in a beryllium refinery and foundry prior to 1949, the negative influence on the health of a population exposed during a major fire in a beryllium facility and recommended maximum allowable concentrations are discussed.##

ATMOSPHERIC INTERACTION

09472 12

Bhandari, N. D. Lal, and Rama

STRATOSPHERIC CIRCULATION STUDIES BASED ON NATURAL AND ARTIFICIAL RADIOACTIVE TRACER ELEMENTS. Tellus, 18(2-3):391-406, 1966. 17 refs. (Presented at the CACR Symposium on Atmospheric Chemistry, Circulation and Aerosols, Visby, Sweden, Aug. 18-24, 1965.)

The nature of large scale stratospheric circulation is studied using the cosmic ray produced isotopes P32, Be7, S35 and Na22 as tracers. Supplementary information obtained from observations of the distribution of the bomb-produced Na22 and radongenic Pb210 is taken into account. The activities of these tracer elements have been measured in the stratospheric air, up to altitudes of 20 km. during 1960-64. Data are fairly extensive for studying the characteristics of the mean circulation in the stratosphere as well as seasonal changes in patterns of mixing/transport of air in certain regions of the stratosphere. The analysis allows us to distinguish three zones in the lower stratosphere (below 20 km), well separated from the tropopause, having distinct circulation patterns. These regions are separately well mixed either vertically or horizontally; the mean time of residence of aerosols in these regions differs appreciably too. The most stable region in the stratosphere is found to be 18-20 km region at 0-30 degrees latitude, where apparent residence times are of the order of twenty months. Polar regions are observed to exhibit an enhanced vertical mixing during November-February. Combining these results with the observations of dispersion of bomb-produced Na22, which appeared in significant amounts from early 1962 onwards all over the stratosphere, we deduce that in the polar regions, vertical mixing occurs rapidly during November-February so that any activity injected in this region at 20 km or so mixes downwards at the rate of about 1.5 km month. It is concluded that the observed spring peaks in the troposphere are merely the consequence of this phenomena which is October-November. The observations of concentrations of Pb210 triggered in upper levels (avove 20 km) of the stratosphere during in the stratosphere are discussed. (Authors' abstract modified)

05223 13

H. E. Cramer, H. Hamilton, and G.DeSanto

ATMOSPHERIC TRANSPORT OF ROCKET MOTOR COMBUSTION BY-PRODUCTS. Volume II. Experimental design and field installation (Final Report). GCA Corp., Bedford, Mass., GCA Technology Div. (Dec. 1965). 46 pp.

The emission of potentially toxic combustion products released during rocket tests ought not result in significant contamination of San Nicolas Island and its environs. This volume describes the conduct of diffusion experiments, measurement techniques, and the installation of meteorological and aerosol-sampling instruments at San Nicolas Island. One part of the experimental program was concerned with measurements on San Nicolas Island to be made during scheduled rocket booster firings when the beryllium-oxide effluent was to be released into the atmosphere. The second part was concerned with the problem of atmospheric transport and dispersal at intermediate and long distances downwind from San Nicolas Island which could be investigated independently of rocket firings, using the tracer material. No rocket boosters were fired at the San Nicholas Island facility during this program. The portion of the program designed to collect data on the physical properties of the beryllium oxide aerosol cloud was used only to collect samples from which an estimate of the beryllium-oxide background concentration levels on San Nicolas Island could be made. Five 146-foot towers were used as sampling platforms at various elevations. Deposition and fallout were measured from surface soil samples and from 3 5/8 inch diameters horizontal containers. Over-water sampling was done by airplanes equipped with drum-impactor type samplers. Deficiencies in the present state-of-the art of aerosol cloud measurement are pointed out. The need exists for a device that will indicate in real time the presence or absence of an aerosol.

11764 14

Dilts, R. L., L. H. Robinson, and H. E. Ghilarducci

TOXIC EXHAUST CLOUD DIFFUSION STUDY. Aerojet-General Corp., Sacramento, Calif., Contract AF 04(611)-11623, AFRPL-TR-67-115, 74p., May 1967. 12 refs.
DDC: AD 814801

A field study of exhaust diffusion from solid rocket motors was conducted at the Aerojet-General Lovelock, Nevada, Facility. The primary objective of the program was to correlate the diffusion of puff-type rocket motor exhaust clouds with measurable meteorological variables under stable atmospheric conditions. Two sets of field data were collected from 413 air samplers used during the static tests of rocket motors containing a nominal 2100 lb of beryllium propellant. The difference in the values of the predicted versus is presented. The results from this exposure data were much lower than anticipated and indicate a significant mass loss. The most probable explanation is that the exhaust clouds penetrated the shallow inversions defined by the upper air temperature profiles. Consequently, a large percentage of the tracer particles could not penetrate the bottom lid of the inversion to return to the ground as the clouds diffused. This explains the mass loss although particle deposition could also be involved. Since the study was limited to two sets of field data, specific correlation of exhaust cloud diffusion with measurable meteorological variables could not be attempted. (Author abstract modified)

10215 15

Drozdova, V. M. and P. F. Svistov

THE CONTENTS OF SOME MICROELEMENTS IN ATMOSPHERIC PRECIPITATIONS. ((O soderzhanii nekotorykh mikroelementov v atmosfernykh osadkakh.)) Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), No. 207:92-98, 1968. 12 refs.

Atmospheric precipitations collected in Voeikovo, Vyazovye, Mudyug, Kashira, Dal'nie, Zelentsy, Sobakino and Kudymkar during 1964-1965 were analyzed for microelement contents. The samples were processed by extraction with sodium diethyldithiocarbamate or kupferon in chloroform. The extracts containing the microelements were then analyzed spectrographically. Other samples were treated with an ion exchange resin and the concentrates analyzed spectrographically. All samples contained Si, Cu, and Mn. In many samples iron was detected. Cadmium was not found; either it was not present or the methods used were not sensitive enough. Be, Pb, Al, Ba, and Ti were also determined in some samples.##

05455 16

K. Potzl and W. Carnuth

ISOLATING AND IDENTIFYING 7BE IN THE ATMOSPHERE. Isolierung und Identifizierung des Atmospharischen 7 Be. Radiochim. Acta 6, (3) 133-5, Dec. 1966. Ger.

At altitudes of 12 to 16 km, cosmic radiation produces various radioisotopes, one of them being 7Be from the bombardment of N and C by nuclei of more than 50 MeV. It half-life of 53 days and its high activity of 0.02 - 0.5 decays /min/cu m, 12% of which is by gamma-emission of 0.48MeV, make it a suitable tracer for studying atmospheric exchange through the tropopause. In order to allow gamma-spectrometric determination of 7Be, it must be separated from other radio nuclei such as those found in radioactive fallout. A chemical process of eparation is described whereby 7Be together with inactive Be as carrier is separated from rain water. The precipitates of beryllium hydroxide may still contain 95Nb, but its gamma energy of 0.77 MeV is far enough away from the Nb gamma line so as not to interfere.##

00375 17

R. A. Prindle

AIR POLLUTION AND COMMUNITY HEALTH (CHAPTER EIGHTEEN). Medical Climatology 505-18, 1964.

In this chapter author reviews major pollution episodes which have occurred since 1930 in various parts of the world. These episodes have demonstrated the danger and the lethality that may result when certain meteorologic phenomena occur in geographical areas where potentially high concentrations of air pollutants may form. Certain pollutants that might be tolerated in low concentrations in some inhabited areas might become dangerous when mixed with pollutants from other sources that could exert an accentuating or synergistic action. SO2, particulates, CO, beryllium, lead, fluoride, photochemical, and allergenic pollutants and their effect on man and animals are discussed. The most important animal experiments as well as other research are reviewed.##

20849 18

Rangarajan, C. and Smt. S. Gopalakrishnan

SEASONAL VARIATION OF BERYLLIUM -7 RELATIVE TO CAESIUM -137 IN SURFACE AIR AT TROPICAL AND SUBTROPICAL LATITUDES. Tellus (Uppsala), 22(1):115-121, 1970. 16 refs.

A comparative study of the seasonal variations of cosmic-ray produced Beryllium -7 (Be -7) and fission product Caesium-137 (Cs-137) was conducted in the surface air at Bombay and elsewhere. Both isotopes attain peak values during the spring months. The amplitude of increase is much less in the case of Be-7 compared to stratospheric Cs-137. This difference is due to only a part of Be-7 in surface air being of stratospheric origin. By comparison with Cs-137, it is estimated that the stratospheric component of Be-7 is about 60% in spring, decreasing to 25% in the autumn. Both isotopes are controlled by the same meteorological processes which evidently transfer them from the upper tropsphere to ground level.

CC091 19

D.G. Silva

DIFFUSION BIBLIOGRAPHY. Los Angeles Air Force Station, Calif., Space Systems Division, May 15, 1965, 8 p.
CFSTI, DDC: AD 464881

The emphasis placed on air pollution and diffusion by the Clean Air Act has necessitated a review of technical information published on diffusion and related areas. The author developed this bibliography while preparing a paper entitled "Propellant Toxicity and Diffusion Prediction Methods". The bibliography deals primarily with diffusion studies and prediction methods and was not intended to cover the entire field of air pollution. It is hoped that this effort will be useful to Air Force Bioenvironmental Engineers and Meteorologists who may have a need for this type of information. (Author)##

10065

20

Taylor, John H. (ed.)

PROJECT SAND STORM-AN EXPERIMENTAL PROGRAM IN ATMOSPHERIC DIFFUSION. Air Force Cambridge Research Labs, Bedford, Mass. Office of Aerospace Research, Project
3850 - 01, ERP - 134, (196) p., September 1965. (16 refs.)
CFSTI, DDC: AFCRL-65-649

A series of field experiment in atmospheric diffusion was conducted at Edwards Air Force Base, California, 1963. The primary feature which distinguished this series from similar experimental investigations was that instantaneous sources were studied. Puffs o tracer material were generated quasi-instantaneously by short bursts of small, horizontally fired, solid propellant rocket motors. Trace samples were collected on a horizontal grid that had 350 sampling positions. All of the 43 experiments were conducted under thermally unstable atmospheric conditions. Analyses of the data identified the region of the turbulent energy spectrum which contains the eddies that are effective in diffusing the clouds. Eulerian measurements o turbulence are shown to be correlated with lateral rates of cloud growth. Downwind distributions of peak inhalation-level dosages wer found to be quite irregular with the anomalies unpredictable on the basis of measurable meteorological parameters. It was, nevertheless possible to develop an operationally useful estamating equation relating peak dosages to distance from the source. (Author's abstract)

09070

21

Thomas, C. W. and N. A. Wogman

ATMOSPHERIC BEHAVIOR OF AIRBORNE RADIONUCLIDES. In: Pacific Northwest Laboratory Annual Report for 1966 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part 2. Radiological Sciences. D. W. Pearce and H. R. Compton (eds.), Battelle Memorial Institute, Richland, Wash., Pacific Northwest Lab., Contract
AT(45-1)-1830, p. 4-17, Dec. 1967. 27 refs.
CFSTI: BNWL-481-2

The concentrations of Be-7, Na-22, Sc-46, Mn-54, Co-60, Zn-65, Y-88, Zr-95, Nb-95, Ru-103, Ru-106, Ag-110m, Sb-124, Sb-125, Cs-134, Ba-140, La-140, Ce-144 and Th-228 in air near ground level have been measured continuously at three latitudes in the world. Data suggest that the annual latitudinal spring increase of radionuclide concentration results from rapid stratospheric mixing and indicates a mean residence half-time of 11.7 plus or minus 0.088 months for stratospheric debris. The amplitude, width and arrival time of the spring concentration maximum showed a latitude dependency. The Be-7 concentration was of great interest but additional sampling at more latitudes will be needed to define its various relationships. Short half-life radionuclides which were injected into the troposphere by Chinese testing have suggested a tropospheric radionuclide residence half-time of 9 days and have indicated a circumnavigating time of 10 days for nuclear debris at 45 deg N latitude.##

MEASUREMENT METHODS

12577 22

Bokowski, D. L.

RAPID DETERMINATION OF BERYLLIUM BY A DIRECT-READING ATOMIC ABSORPTION SPECTROPHOTOMETER. Am. Ind. Hyg. Assoc. J., 29(5):474-481, Sept.-Oct. 1968. 12 Refs.

A sensitive and specific analytical method for beryllium in air, swipe, biological and packing material samples was developed. A single-beam atomic absorption spectrophotometer and high-temperature nitrous oxide-acetylene flame is used. The chemical technique for sensitivity enhancement and decontamination from radionuclides is described. Maximum time expenditure for an analysis is less than 30 minutes. Multiple samples may be run in the same time period. Sensitivity of the method is less than 0.04 parts per million of beryllium with a repeatability of approximately 2% of the amount present. Decontamination factors for uranium and transuranium elements were greater than 5000. (Author's Abstract)##

05213 23

R. S. Braman

RESEARCH AND DEVELOPMENT OF AN AUTOMATIC BERYLLIUM AND BORON MONITOR . Armour Research Foundation, Chicago, Ill. (Rept. No. ARF 3203-3.) June 8, 1962. pp. 95.

The design, construction, and final testing of a prototype borane monitor were completed. Detection of boranes in air is based upon the flame emission of boron in a hydrogen-air flame. Sensitivity is in the 50-ppb range. The prototype has ranges of 0 to 2, 0 to 13, and 0 to 60 ppm. Ammonia and hydrazine interfere to the extent that 250 and 360 parts of these, respectively, produce the same effects as 1 part of pentaborane. The borane monitor is portable and is capable of independent operation for approximately 9 hr. The design, construction, and final testing of a prototype beryllium monitor were completed. Detection is based upon the reaction of beryllium with high-energy alpha particles. Beryllium is deposited onto the surface of a filter tape which passes through a detection chamber. Counting rate data from the Be/9 (alpha, n, gamma) C-12 reaction are used in two alarm circuits which are activated at two beryllium concentrations. The instrument is capable of sensing 0.25 to 0.5 microgram of beryllium. It is line operated. (Author abstract)##

05035

24

R. S. Braman

RESEARCH AND DEVELOPMENT OF AN AUTOMATIC BERYLLIUM-IN-AIR MONITOR. IIT Research Inst., Chicago, Ill. 1963. 58 pp. (Technical Documentary Rept. No. RTD-TDR-63-1112.)

An improved model beryllium-in-air monitor has been constructed, calibrated and tested in the laboratory. Significant improvements include optimization of the air sample system design and elimination of the temperature instability of critical electronic parts. A concentration of 25 micrograms per cubic meter beryllium -in-air requires 4 minutes for reliable alarming, a low level concentration of 2 micrograms beryllium requires 60 minutes. Sensitivity, alarm reliability and response time are all dependant primarily upon the construction of the alpha source. Other characteristics of the device and instrument design have been optimized. (Author abstract)##

05841

25

M. M. Braverman, F. A. Masciello, and V. Marsh

SPECTROGRAPHIC TRACE ANALYSIS OF AIR-BORNE PARTICULATES. (J. Air Pollution Control Assoc.) 11 (9), 408-9, 427 (Sept. 1961). (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The procedures presented here were designed for use in processing minute traces of metals present in small quantities of particulate matter. Special emphasis has been directed to the analysis of spots of filter tape samples but attention is also given to samples collected on ashless filter paper by high volume samplers which have been operated for one hour only. Successful procedures have been developed for milligram quantities of sample containing microgram quantities of numerous metals. No transfer of sample from filter paper is necessary but a number of spots may be combined to increase sensitivity when indicated by low visible intensity. The fundamental approach of these procedures is the use of the ashed sample rather than an acid leach which frequently introduces errors due to incomplete solubility of the metals and to varying amount of impurities leached from the filtering medium. The key operation in the analysis of the particulate matter collected by the smoke sampler is the selection of the spots. The spots are cut out, ashed, and weighed. A corresponding weight of filter paper surrounding the spots is also weighed and represents the blank. The ashed sample or blank is transferred to a polystyrene vial. Thirty mg of graphite indium standard mixture, are added and the vial is agitated. The intensity ratios of each metal are compared to the standard indium lines, and the micrograms of each metal are sought by consulting the working curves. Micrograms per cubic meter for each metal are calculated by dividing micrograms by volume of air processed. Approximately 1000 atmospheric samples have been analyzed for Cu, Zn, Cd, Sr, Co, V, Mo, Be, Bi, Ni, Cr, Pb, Sn, Mn, Sb. If necessary analysis for Ca, Al, Fe, Si, Mg and Ge can be included. The method is generally accurate from 10 to 20% of the component determined. Usually this is resolved when a different spectrum line of Indium is used in the intensity ratio.##

06658 26

M. S. Bykhovskaya

COMPARATIVE EVALUATION OF SOME METHODS FOR THE DETERMINATION OF BERYLLIUM AND ITS COMPOUNDS APPLICABLE TO AIR ANALYSIS . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 102-8, 1962. (Gigena Truda i Prof. Zabolevaniya) 1, (6) 49-53, 1957. Translated from Russian.
CFSTI: 62-11103

Several methods for the determination of beryllium in the air are compared. The work was conducted with standard beryllium solutions and also with artifical mixtures containing fixed amounts of calcium, magnesium, iron, aluminum, zinc and manganese. A comparative evaluation was made of the methods for the determination of beryllium by fluorescence with morine, 1-amino-4-oxyanthraquinone, 1,4-dioxyanthraquinone and by colorimetry with quinalizerin, thoron, N-resorcinol, arsenazo, and beryllon II. Simultaneously, the tests were made with trylon B the disodium salt of ethylenediaminotetra-acetic acid, in an attempt to counteract cationic interference and to separate the constituents by paper chromatographic partitioning. The most sensitive and rpomising methods for the determination of beryllium in the air of industrial premises are; the fluorescence method with morine and the colorimetric determination with beryllon II. Use of trylon B as a complex-former eliminated the effect of many interfering elements and made possible the determination of beryllium in the presence of calcium, magnesium, iron, zinc, aluminum, and manganese, without their preliminary separation. The spectrographic method of beryllium determination yielded promising results. The method of paper partitioning chromatography appeared promising as a semi-quantitative method for the determination of beryllium in the presence of calcium, magnesium, iron, manganese and aluminum.##

05574 27

L. A. Chambers, M. J. Foter, and J. Cholak

A COMPARISON OF PARTICULATE LOADINGS IN THE ATMOSPHERES OF CERTAIN AMERICAN CITIES. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 24-32.

A program of high-volume air sampling and analysis of particulate material was undertaken in a total of more than 30 cities. Each sampling site was chosen to represent the composite of air pollutants characteristic of an area. Each sample for analysis represents the total of particulate matter in sizes down to 0.3 micron removed from approximately 2,000 cubic meters of air during a 24 hour period. The results of particulate analyses are grouped in tables according to urban and nonurban areas, population, and size of city. Seasonal distribution in major cities is also graphically illustrated.##

C4986 28

J. Cholak

THE NATURE OF ATMOSPHERIC POLLUTION IN A NUMBER OF INDUSTRIAL COMMUNITIES. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 6-15.

An expanded electrostatic precipitator sampling program for investigating certain more general characteristics of the air pollution of Cincinnati was resumed in 1946. Starting with twelve sampling sites, the program was gradually enlarged in scope during the period 1946-51 to include the measurement of a number of gaseous pollutants as well as determinations of the composition of the particulate matter suspended in the air. Various other pollutants were included in the investigation as facilities for collecting samples and techniques for their analysis were improved. During this same period opportunities presented themselves for the study of pollution problems of a number of other communities. Since these data, obtained by comparable methods, are of interest in showing the similarities and differences in the character of the atmospheric pollution of various communities, it is our purpose (1) to describe the nature of the air pollution of Cincinnati, (2) to compare the Cincinnati data with the findings obtained during the course of shorter studies in other communities, and (3) to amplify the picture with results of observations reported in the literature. In making such use of the data of other investigators the analytical approach has been given careful consideration in order to make certain that comparable data were being dealt with.##

04651 29

R. T. Commins R. E. Waller

OBSERVATIONS FROM A TEN-YEAR-STUDY OF POLLUTION AT A SITE IN THE CITY OF LONDON. Atmos. Environ. 1, (1) 49-68, Jan. 1967.

As part of an extensive study of the effects of air pollution on health, measurements of pollution have been made at a site in London for more than ten years. The results of daily measurements of the concentration of smoke and sulfur dioxide made throughout that period and of more frequent measurements made during episodes of high pollution are reported. These show a reduction in the annual mean and peak concentrations pf smoke during the ten year period, but there have not been any significant changes in the concentrations of sulfur dioxide. Occasional measurements of a wide range of other pollutants are also reported and results from a series of measurements of polycyclic aromatic hydrocarbons indicate a decline in the concentration of this potentially carcinogenic component of pollution in London. (Author abstract modified)##

21638 30

Feldstein, Milton

ANALYTICAL METHODS FOR AIR POLLUTANTS. In: Progress in Chemical Toxicology. A. Stolman (ed.), vol. 1, New York, Academic Press, 1963, p. 317-338. 22 refs.

Methods are presented for the analysis of atmospheric contaminants. Three categories of pollutants are considered. The first group are pollutants which may have a direct toxic effect if present in the atmosphere in sufficient concentration for a sufficient period of time. These include fluoride, carbon monoxide, sulfur dioxide, beryllium, and lead. The toxic effects which may be manifested include direct toxicity on man, toxic effects on vegetation, or indirect toxic effects on cattle foraging on vegetation which has absorbed or been dusted with the contaminant. The second group are pollutants which may not be present in the atmosphere in sufficient concentration to cause toxicity, but which create nuisance problems due to odor. These include hydrogen sulfide and mercaptans. The third group are pollutants which are involved in the photochemical process which occurs in the ambient atmosphere and which leads to the formation of reaction products which are eye-irritating, vegetation-damaging, and visibility-reducing. These pollutants include NO_2, NO, and hydrocarbons. Of interest in this area is the measurement of O_3 which occurs as a by-product of this photochemical process. The development of continuous automatic recording instruments for the measurement of certain air contaminants is discussed.

20642 31

Just, J., S. Maziarka, and H. Wyszynska

SANITARY EVALUATION OF DUST CONTAIN IN AMBIENT AIR OF SOME CITIES IN POLAND. (Sanitarna charakterystyka i ocena zapylenia powietrza atmosferycznego niektorych miast w Polsce). Text in Polish. Gaz, Woda Tech. Sanit. (Warsaw), 44(3):96-100, 1970. 23 refs.

Samples of atmospheric aerosols were systematically collected in ten towns. The contents of dust, tar, some polycyclic aromatic hydrocarbons, lead, and beryllium were determined. The level of atmospheric pollution was evaluated on the basis of existing standards and toxicological literature. High contents of particulate matter in the air were found in all the towns studied; the highest levels were found in Zabrze, Katowice, and Krakow. In several towns, the level of airborne carcinogenic hydrocarbons was also very high. It is believed that the metal content would cause no harmful effects.

04996 32

M. Katz

SOURCES OF POLLUTION. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 95-105

The wind and cloud conditions in the Detroit River area for five years are summarized. Sulfur dioxide was measured by antometers. Hydrogen sulfide, chlorine, oxides of nitrogen, and ammonia were sampled. Suspended particulates were collected. The distribution of dust fall components is tabulated. About twenty metallic elements were identified by x-ray diffraction of suspended particulates. Community health surveys covering morbidity and mortality records and accounting for ethnic and socioeconomic factors are outlined.##

33

08079

Keenan, Robert G.

CHEMICAL ASPECTS OF ENVIRONMENTAL HEALTH. Occupational Health Rev.Ottawa, 18(1):3-8, 1966. 39 refs.

Modern methods of physical and chemical analysis, as applied to biological materials, atmospheric samples containing gaseous or particulate contaminants, industrial process materials, intermediates, and finished products are discussed briefly. A discussion of the uses to be made of such analytical data includes: (1) the "normal" concentrations of certain metallic elements in body tissues and fluides; (2) the need to compare these concentrations with those developed analytically on samples from exposed subjects; (3) the comparison of atmospheric concentrations of contaminating substances found in the working environment with the A.C.G.I.H. Threshold Limit Values; (4) the analysis of industrial process materials, settled dusts, and finished products to help in assessing the total exposure of the worker to chemical elements. (Author|s abstract, modified)

34

03923

F. D. Krivoruchko

PHOTOMETRIC DETERMINATION OF BERYLLIUM IN AIR BY MEANS OF CHLOROPHOSPHONAZO R. Hyg. Sanit. 31, (4-6) 69-83, Apr.-June 1966. Russ. (Tr.)
CFSTI: TT 66-51160/4-6

The photometric determination of beryllium in air using chlorophosphonazo R is based on the formation of a colored compound (pinkish to yellow) at pH 9.4, due to the reaction of beryllium ions with chlorophosphonazo R. The sensitivity is 0.05 micrograms Be in 7 ml of solution. The use of an efficient complexer, consisting of Trilon B and a trithanol amine and borate buffer solution, eliminates the influence of several interfering elements and makes it possible to estimate beryllium in the presence of 100 micrograms iron; 200 micrograms manganese, zinc, or copper; 300 micrograms aluminum, calcium, or magnesium; 500 micrograms molybdenum; 1000 micrograms nickel or cobalt; 25 micrograms silicon; and 200 micrograms titanium.##

09333 35

Lial W. Brewer, (ed.)

ANALYTICAL PROCEDURES FOR THE ENVIRONMENTAL HEALTH LABORATORY. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab., SC-M-3044, 147 p., Feb. 1968. 13 refs.

This is a manual compiled of thirty-nine analytical procedures used by an industrial hygiene laboratory. The procedures for the following substances in air are included: The Determinaton of Acetone, Acid and Alkali Contaminants; Benzene, Toluene, and Other Aromatics; Beryllium (Spectrographic Method); Beryllium (Morin Method); Cadmium; Chromic Acid, Chromates, and Dichromates; Formaldehyde; Lead; Methanol; Nitrogen Dioxide; Oil Mist; Ozone (Colorimetric Method); Ozone (Titration Method; Phosgene; Silica (Colorimetric Method); Sulfur Dioxide; Thallium; and Zinc.##

02415 36

C.W. Louw

ATMOSPHERIC POLLUTANTS AND THEIR ANALYSIS (SPECIAL REPORT SMOG 2). Council for Scientific and Industrial Research, Pretoria, (South Africa). Air Pollution Research Group 1966. 60 pp.

In view of the recently passed Act on Air Pollution (No. 45 of 1965) in South Africa and the anticipated increase in interest and analytical activity in this field, it was felt that the need existed for an up-to-date survey of air pollutants and their analysis. A review report was consequently prepared and is presented here. Aspects such as the types, sources and occurrence, concentrations and methods of analysis of the various pollutants are discussed. Also, recommendations are made with regard to the selection of suitable analytical methods. (Author abstract)##

04642 37

J. P. McClosky

SPECTROPHOTOMETRIC DETERMINATION OF BERYLLIUM IN AIRBORNE DUST SAMPLES. Microchem. J. 12, 40-5, 1967.

A simple, rapid, and accurate spectrophotometric procedure for the determination of beryllium in airborne dust samples has been developed, with aluminon reagent used for color formation. The use of a complexing buffer solution containing one complexing and two chelating agents improves on the specificity of previous methods. In contrast to the Zenia method which has a lower limit of 2.5 microgram, the present procedure is much more sensitive and affords accurate results for beryllium contents as low as 0.3 microgram. Also, the procedure is rapid, as many as 40 samples having been analyzed in a normal 8-hr work period by a single analyst. (Author summary)##

00490 38

P. R. Mohilner

SPOT TEST FOR BERYLLIUM BASED ON COLOR REACTION WITH ERIOCHROME CYANINE R. Anal. Chem. Vol. 35:1103, July 1963.

Difficulties were encountered in attempting the morin spot test for beryllium because impure reagent gave rise to strong fluorescence of the blank. To avoid this difficulty a color reaction spot test for beryllium has been devised based upon the reaction with Eriochrome Cyanine R used by Hill for the spectrophotometric determination of beryllium. This reaction has also been applied in a ring oven determination of beryllium. By modification of Hill's masking system, it was possible to obtain a test with a limit of identification of 0.1 microgram of Be in the test drop. Of 67 ions tested, none interfered when 50 micrograms were present in the test drop with 1 microgram of Be. Although Eriochrome Cyanine R reacts with a number of ions, the combined masking effects of tartrate and EDTA make this test highly selective for beryllium. The use of a buffer in the reagent solution is required to control the pH to obtain the neutral color of the reagent. In acidic or strongly basic media, the reagent color is sufficiently similar to the color of the reaction product with beryllium to make the reaction useless for identification purposes.##

17102 39

Morik, Jozsef

MEASUREMENT OF AIR POLLUTION IN HUNGARIAN INDUSTRIAL CENTERS. (A levego szennyezettsegenek merteke ipari telepuleseinken). Text in Hungarian. Magy. Tud. Akad. Orvosi Tud. Oszt. Kozlemen., 18(3/4):417-424, 1967.

Budapest has by far the most serious air pollution problems of any Hungarian industrial center as shown by large scale measurements over a 10-15 year period. Data is presented in the form of 7 tables, compiled both by the author and by other Hungarian authors, based on studies of air pollution in Hungarian metropolitan areas. Eleven such areas, including Budapest, almost consistently show values in excess of the legally permissible limits of dust, carbon particles, and sulfur dioxide. In some of these communities, there are also excesses of such dangerous substances as chromium, phenol, beryllium, copper, silicon, and manganese. In the industrial sectors of the big cities, in addition to soot, dust, and sulfur compounds resulting chiefly from some type of combustion, one also finds a noticeable content of ammonia, the nitrogen oxides, chlorine gas, and organic chlorine compounds such as chlorphenol. The stench of some of these organic compounds, particularly the chlorinated hydrocarbons, is noticeable as much as 15-20 kilometers away. Measurements of fluorine pollution in the vicinity of the

Varpalata aluminum plant gave figures of 0.097 mg of fluorine per cu meter at 2 km distance from the plant, and 0.67 mg at a distance of 20 meters. The permissible limit is 0.01.

10988 40

Muller, R. H.

ATOMIC ABSORPTION/FLAME EMISSION INSTRUMENT OFFERS VERSATILE AND AUTOMATED OPERATION. Anal. Chem., 40(10):85A-87A, Aug. 1968.

The new Jarrell-Ash fully compensated atomic absorption/flame emission unit was designed for the automatic, quantitative measurement of 12 metallic elements collected on filters from air streams in New York City. The instrument was designed to correct errors in atomic absorption analyses that arise when determinations are to be made in difficult matrices or under different conditions. The instrument is usable both in atomic absorption and flame emission modes of analysis. The apparatus carries all logic and command circuits necessary for correction to automated sample presentation and readout systems.##

06494 41

Nakamura, J. T. and K. E. Ball

ATMOSPHERIC MONITORING OF TOXIC LEVEL OF MISSILE PROPELLANTS. Am. Ind. Hyg. Assoc. J. 25(1):77-80, Feb. 1964.

The problem of toxicity in the over-all missile industry represents both the materials involved and the amassed quantities of these materials. Although most missile fuels and oxidizers are predictable in their behavior, the handling of these relatively common compounds in tonnage lots presents problems which have not been explored and therefore cause due concern. Spill tests, conducted at the Edwards Rocket Research Laboratories, releasing up to half-ton quantities of such propellants as fluorine, nitrogen tetroxide, hydrazine, UDMH, chlorine trifluoride, and pentaborane have been conducted. In some tests, fuels and oxidizers were spilled together. The purpose being to determine the magnitude of the hazard; that is, the aspects of explosion and fire as well as toxicity and pollution. The following are felt to be reasonable requirements for a tentative atmospheric monitoring arrangement: (1) accuracy plus or minus 25%, (2) range capable of at least two orders of magnitude, preferably more, (3) speed of Response 90% of final reading or more in less than 10 seconds, (4) specificity - the instrument need not be 100% specific for a particular fuel or oxidizer since in many cases there is little chance of any other material being in the vicinity. Common solvents, degreasing fluids, oil, gasoline and materials of this nature should not cause an interfering signal. A fuel concentration should not inhibit the response of incorporated into a detection system. These "extras" might include explosion-proof design, malfunction-indicating devices and elaborate centralized readout systems. For many application, a may provide adequate information. The choice specifications for a

detection system should be governed by the specific problem involved and the type of information required.
choice specifications for a detection system should be governed by detectors and spot-check devices. In a few applications, required.##

14298 42

Noweir, Madbuli H. and Jacob Cholak

GAS CHROMATOGRAPHIC DETERMINATION OF BERYLLIUM IN BIOLOGICAL MATERIALS AND IN AIR. Environ. Sci. Technol., 3(10):927-930, Oct. 1969. 13 refs.

The gas chromatographic determination of ultratrace quantities of beryllium in urine, blood, tissue, and airborne dust is described. The method has application when only small quantities of the material to be analyzed are available or when it is suspected that the quantities of beryllium present are likely to be less than, or near, the limit of detection by the more variable spectrographic method. The sensitivity is such that only one-thirtieth the amount of sample used in the spectrographic method is required to attain the sensitivity of 0.01 microgram/L of urine, per 100 grams of tissue, or per cu m of air. However, the method also performs satisfactorily for higher concentrations of beryllium. Except for airborne dust, the method involves a double extraction, first with acetylacetone in benzene and then with a benzene solution of trifluoracetylacetone. Beryllium in airborne dust is extracted only by trifluoracetylacetone in benzene. Levels as low as 0.0001 microgram of beryllium per sample can be determined by this method. Except for Fe(3 plus) and Al(3 plus), none of the ions usually present in airborne dust or biological material interferes with the analysis. Ferric ion is removed in a magnetic mercury cathode; Al(3 plus) can be precipitated with 8pquinolinol in chloroform. Recovery of beryllium ranged from 70 to 90% at levels from 0.001 microgram to 0.10 microgram per sample. The method is reliable, as shown by the results of analysis of airborne dust and lung tissues. (Author abstract modified)

11165 43

Rossano, August T. and Hal B. H. Cooper

SAMPLING AND ANALYSIS. Chem. Eng., 75(22):142-146, Oct: 14, 1968.

Knowledge of the types and rates of emissions from a source or group of sources is fundamental to appraising an air pollution problem. Three factors are critical in source testing and analysis: measuring gas properties in the duct, withdrawing representative samples, and accurate analysis.

03526 44

P. Stocks, B. T. Commins, K. V. Aubrey

A STUDY OF POLYCYCLIC HYDROCARBONS AND TRACE ELEMENTS IN SMOKE IN MERSEYSIDE AND OTHER NORTHERN LOCALITIES. Intern. J. Air Water Pollution 4, (3/4) 141-53, 1961.

Smoke samples collected continuously for one or more years by filter in Merseyside conurbation and elsewhere in northern England and Wales were analysed for 7 polycyclic hydrocarbons and 13 trace elements. The locations included seaside and riversie, small and large towns, a smokeless zone, the Mersey Tunnel, bus and motor car garages, an office and a steelworks. The amount of coronene in smoke varied little in town or country but the higher levels in tunnel smoke and in the motor garage were sucha s to suggest its usefulness for measurement of air pollution by motor traffic. In country places amounts of smoke and of the hydrocarbons were 2 1/2 times as great in the autumn-winter half of the year as in the spring-summer half, but in Merseyside, whilst the seasonal ratio for total smoke was similar, for the hydrocarbons it was about 5 to 1. Indoor office air was less polluted than that outside in winter, the hydrocarbons showing a seasonal ratio about 4 to 1. Trace element concentrations in air were all higher in urban than in country places but only for antimony, vanadium and molybdenum was the excess relatively greater than for total ash. Mersey tunnel air contained very much greater amounts of lead than did the entering air, and in a motor garage the air contained more lead and vanadium than the air outside. In the smokeless zone trace elements were present in smaller amount than at the town centre. In the rolling-mill shed and melting-shop of the steelworks, concentrations of all the elements, particularly of copper, were largely, increased. (Author abstract)##

07951 45

T. Suzuki, T. Okita, K. Iwashima, T. Monma, K. Tanaka , K. Fujisawa

SAMPLING AND CHEMICAL ANALYSIS OF TRACE METALS IN PARTICULATES AT AMAGASAKI, NISHINOMIYA AND ASAHIKAWA. Text in Japanese with English Abstract. Bull. Inst. Public Health (Tokyo). 16(1):1-14, 1967. 13 refs.

Particulates were sampled and trace metals in the particulates quantitatively analyzed. b8the metal content of coal smoke was also determined. Inorganic components of particulates were extracted from glass fiber filters and Be, Cd, Cr, Cu, Fe, Ni, Ti, and V were colorimetrically analyzed. The annual mean particulate concentrations in Amagasaki and Nishinomiya were 0.30 and 0.19 mg/cu m respectively and the concentrations in both cities varied quite similarly. The concentrations of Cr, Cu, Fe, Ni, Ti, and V in the air at industrial and business areas in Amagasaki were considerably higher than those in the air of American and British cities. Since the concentrations of metals, especially of Ni, and Ti, in the air of

Asahikawa were low, it may be inferred that the metal content in coal smoke is usually low. It was found that Cr and Fe were released from widely distributed sources and that a large part of Cd, Cu, Ni, Ti, and V were released from speical sources.##

04502 46

P. W. West and P. R. Mohilner

ESTIMATION OF BERYLLIUM WITH ERIOCHROME CYANINE R USING THE RING OVEN TECHNIQUE. Anal. Chem. 34, (4) 558-60, Apr. 1962.

The microdetermination of beryllium using Eriochrome Cyanine R and the ring oven technique is discussed. The sample of air to be examined for Be content may be collected in any of the customary ways and placed in solution by any methods which avoids the use of fluorides. Only the more soluble forms of Be can be detected by this technique. A Whatman No. 41 filter paper on the ring oven is prepared using Eriochrome Cyanine R solution. A standard scale is prepared by making rings from different concentrations of Be solution. Three rings made from different numbers of portions of the solution are considered sufficienc for the unknown. Each of the 3 rings is then compared visually with the standard scale to see if it matches a unit on the scale or falls between. The concentration of the unknown is then determined mathematically. Once the stable standard scale is prepared the analysis of an unknown, including preparation of the 3 rings, matching and calculation should take less than an hour. Determination can be made on as little as 0.01 mg/ml (0.05 microgram) of Be with an average error of 7%. Of the elements likely to be of significance in air pollution studies none was found to interfere when present in 10-fold excess and only Mg, Th, Al and Cr interfere when present in 100-fold excess.##

21459 47

Zweibaum, Frederic and James Moorhead

A MULTI-ELEMENT ATOMIC ABSORPTION ANALYZER. Atomic Absorption Newsletter, 6(6):134, Nov.-Dec. 1967.

A multi-element atomic absorption analyzer can determine four selected elements simultaneously while retaining the accuracy and sensitivity of the single-element form. This system was primarily designed for the continuous monitoring of several elements concentrated from the atmosphere into a small volume air stream. The air stream with enriched sample content is fed directly and continuously into the burner nebulizer. A block diagram of the system is presented. The four individual element lamps are grouped into pairs, and each pair uses the dual beam path of the instrument simultaneously. A 20 cps chopper chops the light from the hollow cathode lamps. The light from each pair of lamps is then reflected by a flat mirror through a lens onto a 1200 cps, multi-blade chopper. Every blade is a mirror on both sides. Light reflected to one toroid from one pair of lamps forms the reference beam, while the light transmitted from a second toroid forms the sample beam. The reverse is true for the other lamp pair, resulting in four double-beam systems 45 deg out of phase with each other. The beams are recombined with a beam splitter, which consists of a quartz plate onto which aluminum dots are evaporated covering half of the surface. There are two photomultipliers, ahead of which are pairs of exit slits which pass the two wavelengths for the elements being determined. Toxic elements, such as lead and beryllium at industrial facilities can be monitored with this system, and it has been successfully tested with bismuth, nickel, lithium 6 and 7.

CONTROL METHODS

02473 48

A.J. Breslin

SOLVING AIR CONTAMINATION THROUGH DIAGNOSTIC AIR SAMPLING.
Am. Ind. Hyg. Assoc. J., 27(5):460-468, Oct. 1966.

Air sampling can be used as an effective diagnostic tool for the identification of predominant sources of contamination, the proper selection of contamination control methods, and the regulation of occupational exposures. The diagnostic approach in air sampling entails the discernment and interpretation of either location-dependent or time-dependent patterns of contamination or a combination of both. The effort required to distinguish the patterns varies widely, depending on the dominance of the patterns over normal fluctuations in background concentrations of the air contaminant. Examples are cited, covering a range of applications, from the collection of a few samples for the detection of dominant time or location expsure patterns to the use of multisampler arrays at varying time collection intervals. (Author abstract)##

16525 49

Chase, Frank R.

DUST COLLECTION PAYS ITS WAY. Am. Machinist, 114(2):114-118, Jan. 26, 1970

Unless a dust-generating device is closely followed by a dust-collecting device, a serious health hazard exists. This is particularly true with some of the toxic materials, such as beryllium and silica compounds, and silicosis is a respiratory ailment long associated with prolonged inhalation of irritating dusts. Compliance with local pollution control laws is another reason for considering dust-collection equipment. Finally, dust collectors are frequently needed not to get rid of the dust, but to save it, such as plants working with precious metals. Their salvage value more than offsets the cost of collection. Essentially, a metalworking plant is faced with three types of metal waste: chips, dust particles, and loaded lint. In general, two types of dust collectors are in general use: the cyclone type and the fabric-filter type. The cyclone separator is designed for chips or larger particles. The fabric filter type is used for fine particles. The term 'fractional efficiency' is defined. The advantages and disadvantages of dust collectors and a comparative specifications in choosing a dust collector are charted. Several case histories of metalworking installations where a personnel or production problem was solved or alleviated through the use of a dust collector are given.

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03916 50

D. Hasenclever

WHAT MAY BE DEMANDED OF HIGH EFFICIENCY FILTERS? Staub (English Translation) 26, (10) 22-6, Oct. 1966. Ger. (Tr.)
CFSTI, TT 66-51159/10

The use of high-efficiency filters and problems associated with their operation are discussed. A survey of results obtained in Germany after testing high-efficiency mechanical filters (absolute filters) for a period of three years is presented. According to these results 63.3% of fibre filters subjected to tests satisfied the requirements. The permeability of large filters in nuclear plants can, however, be several times higher than of a single filter element or of the filter material used. This is due to the fact that in many cases there are leaks between the filter elements these leaks, which frequently cannot be controlled, by essentially shortening the sealing line. (Author summary modified)##

08492 51

Jirele, Vratislav

EXTRACTION OF BERYLLIUM FROM POWER PLANT WASTE MATERIAL. ((Extrakce berylia z energetickych odpadu.)) Text in Czech. Chem. Prumysl (Prague), 17(4):175-179, April 4, 1967. 6 refs.

Soft coal from the Sokolov region of Czechoslovakia contains considerable amounts of beryllium which pass into the slag and fly ash when the coal is utilized in electric power plants. Significant amounts of toxic beryllium compounds are thus discharged into the atmosphere. The present study was made to investigate a process for the recovery of beryllium from slag or fly ash. Slag containing 800 gm. Be/t. and fly ash from an electrostatic filter containing 787 gm. Be/t. were used for the experiments. Dissolution of Be was tested at 25-100 deg C with HCl, NaOH, H2SO4 and HF. The latter two acids were found most effective. Slags obtained at different combustion temperatures were also tested. The use of fluoride fluxing agents was found to facilitate dissolution of the Be compounds. Separation from acidic solution was tested with solutions of di-(2-ethylhexyl) phosphoric acid (EHPA). The recommended process uses conc. H2SO4 at elevated temperatures and extraction in three stages with 0.1 M EHPA in kerosene at a pH of 2.2, resulting in complete transfer of beryllium into the organic phase. In the presence of high aluminum concentrations, a pH of 1.8 is recommended to suppress extraction of aluminum.##

07443 52

A. Juskiewicz, C. P. Skillern

CONTROL OF BERYLLIUM DURING IMPACT TESTS. Sandia Corp., Albuquerque, N. Mex., SC-TM-67-827, 13p., Nov. 1967.
CFSTI: SC-TM-67-827

Beryllium was impacted from an air gun onto a target which was contained in a large catcher. The resulting beryllium particles were contained so that the air concentration levels in personnel occupied rooms were acceptable for beryllium dusts. Using this air gun and catcher combination, personnel were exposed to very minor amounts of beryllium. No concentration in excess of 0.05 micrograms/cu. m. of beryllium was released to the outside atmosphere.##

02885L

53

E. G. Kendall and W. J. Gardner

DESIGN, CONSTRUCTION, AND OPERATION OF THE AEROSPACE CORPORATION BERYLLIUM TOXIC MATERIALS LABORATORY. Aerospace Corp., El Segundo, Calif., Lab. Operations. July 1966, 43 pp. (Repts. SSD-TR-66-149 AND TR-669(6250-10.)
DDC AD 800263

The report describes the design, construction, and operation of a toxic materials facility capable of performing research and development of new materials containing beryllium, e.g., beryllium alloys, beryllium oxide, and beryllides. Capabilities include powder handling, hot pressing, vacuum induction melting, arc-melting, isostatic pressing, sintering, and ceramic macining. Health physics controls and safety regulations and practices according to AEC standards are completely described. (Author abstract)##

07072

54

M. E. McLouth and J. P. Terry

AIR POLLUTION CONTROL AT CAPE KENNEDY. ((Am. Ind. Hyg. Assoc. J.)) 26 (2), 172-6 (Apr. 1965). (Presented at the American Industrial Hygiene Conference, Philadelphia, Pa., Apr. 26-30, 1964.)

Larger missiles and the increased use of toxic propellants require effective planning and operations to prevent the development of major air pollution problems. At Cape Kennedy Air Force Station, large-scale air-borne sources are of an instantaneous rather than a continuous nature. Significant air contamination sources include missile exhaust, aborts, spills of volatile propellants, disposal of toxic materials, and normal industrial or transportation activities. Abatement techniques incorporating equipment design, operations support, and environmental studies are discussed. Special emphasis is given controls, test data, and problems associated with the Titan II missile program. (Authors' abstract)##

06838

55

A. F. Meyer, Jr.

AIR POLLUTION CONTROL IN THE DEPARTMENT OF DEFENSE. Preprint. (1964).

As part of the over-all systems management procedures for development and procurement of weapons systems, special attention has been given by the U.S. Air Force to the health hazards protection requirements associated with Air Force missile and space booster systems. As part of the mandatory programs, the possibility of environmental contamination of installations and adjacent civilian communities must be investigated. Directives have been issued by the military services specifying procedures to be followed from initiation of a concept involving use of potentially hazardous materials through ultimate use and disposition (Exhibits C through E). The role of the Advisory Center on Toxicology is defined, and the means whereby military agencies obtain prompt advice and assistance outlined. These directives also provide for the various services' methods of providing operational preventive measures, and those relating to their systems development programs. Actual launches from operational strategic missile sites are not conducted except in event of war operations. The principal air pollution hazards at operational missile sites arise from the possibilities of release of vapor from fuels or oxidizer during propellant transfer operations, or as part of missile maintenance procedures. In the case of the Titan II weapons system, the propellants are a mixture of unsymmetrical dimethylhydrazine and hydrazine (aerozene 50), and nitrogen tetroxide. These do constitute personnel hazards. Both are toxic and can be involved in pollution of the air. The Minuteman system uses solid propellants and no potential air pollution problem from that source exists at operational bases. Part of the initial site activation procedures for these weapons systems included the collection of numerous environmental samples to determine the existing physical, chemical, and biological conditions of the site and adjacent areas. During propellant transfer operations qualified environmental specialists of the Medical Service and safety technicians are present with appropriate propellant vapor detection devices.##

08410 **56**

Stevens, Charles H.

ENVIRONMENTAL ENGINEERING IN HANDLING TOXIC MATERIALS. Air Eng., 9(10):30-31, 33, Oct. 1967. 2 refs.

Dust control equipment utilized by Beryllium Corporation in Reading, Pennsylvania is described. Air pollution control equipment was engineered in the late 1950's and installed in 1959 & 1960. The cleaned air discharging from the major collectors, serving such areas as the arc furnace room, Detroit furnace room, foundry and calcining operations, is directed into a final, polishing collector. This final collector is a Wheelabrator Corporation ultra filtration collector which uses a limestone precoat material and asbestos floc to polish the effluent air before its discharge to the outdoors. This ultra collector contains 1,944 filter bags providing 27,216 sq. ft. of Orlon cloth and is designed to filter 162,000 cfm of dust laden air at a 5.95:1 air-to-cloth ratio. The collector was at first operated as an intermittent collector requiring shakedown and reflocing about twice a week. Recently it was converted to a four-compartment continuous automatic unit.##

11996 57

Zahradnik, Lubomir and Jan Mazacek

OBTAINING TRACE AND RARE ELEMENTS FROM POWER PLANT FLY ASH. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 237-244.

The utilization of power plant fly ash for the production of rare and trace elements, such as germanium, gallium, beryllium, vanadium, boron, and uranium is discussed. The elements are present in the fly ash produced by the combustion of coal in chambers where absorption of ash by the slag is high. The accumulation of the trace and rare elements in the ash matter depends on the volatility of their compounds produced by chemical reactions occurring during combustion. Germanium and gallium show the highest degree of enrichment of all trace and rare elements. Germanium is converted during combustion to volatile germanium monoxide, germanium monosulfide, and germanium disulfide. Treatable concentrations of both germanium and gallium are obtained in cyclone slag-top furnaces and boilers with strap gates. Their accumulation in fly ash may be due to surface sorption. On the other hand, the presence of beryllium and uranium is influenced by the disintegration and escape of vitrain components to the organic matter to which both metals are bonded. In grate and cyclone furnaces, a two-stage dust collecting system is used for germanium- or gallium-containing fly ash; a mechanical separator sorts out gross fly ash components and an electrostatic precipitator effectively absorbs the fine fly ash components.

EFFECTS – HUMAN HEALTH

13446 58

Anbar, M. and M. Inbar

THE EFFECT OF CERTAIN METALLIC CATIONS ON THE IODIDE UPTAKE IN THE THYROID GLAND OF MICE. Acta Endocrinol. (kobenhaven), 46:643-652, Aug. 1964. 21 refs.

It has been reported that certain metal ions interfere with the iodine uptake in the thyroid. The effect of various metallic cations on the iodine uptake into the gland was studied. Ten experimental mice were used for each material to be examined. The metallic cations to be tested were administered in isotope form and traced by a radioactive tracer. The iodine uptake was calculated in terms of % of injected dose accumulated in the gland or as a concentration ratio. Ferric, cupric, mercuric, zinc, cadmium, and nickel ions at the dose level of 0.1 millimoles per kg body weight were found to decrease the uptake of iodine in the thyroid gland. Manganous ions exhibited a similar effect when the dose was doubled. A parallel decrease in fluoroborate could be demonstrated. This suggests an interference at the stage of iodide accumulation. Cobaltous, cobaltic, magnesium, beryllium, and zirconium ions were shown to have not effect on iodine uptake at the same dose level. The extent of influence upon thyroxine production was discussed.

11642T 59

L. N. Belyayeva

CHARACTERISTICS OF THE CLINICAL COURSE OF PNEUMONIA RELATED TO BERYLLIUM COMPOUND POISONING. ((Osobennosti klinicheskogo techeniya pnevmonii pri intoksikatsii soedineniyami berilliya.)) Translated from Russian. Gigiana Truda i Prof. Zabolevaniya, Vol. 9, Mar. 1965, pp. 28-32. 6 refs. Foreign Technology Div., Wright-Patterson AFB, Ohio, FTD-MT-24-308-67, 6p., Nov. 21, 1967.
CFSTI, DDC: AD 677248

Pneumonia, which is the most serious and rather frequent complication of beryllium compound poisoning, appearing in 20% of the cases, develops in the interstitial tissue against the background of toxic lesion to the alveoli and bronchioli, which leads to particle atelectasis and dilation of some parts of the lungs with considerable increase in permeability of pulmonary vessels. The records of 60 patients with this condition were analyzed. The development of pneumonia is usually related to concomitant secondary pneumotropic infection or activation of existing microflora which acquires virulent properties. In view

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of the significant changes in reactivity of the organism most cases of beryllium related pneumonia have a hypoergic course without significant temperature elevation with moderate levkocytosis or normal leukocyte content, without any special stab-nuclear shift. Arterial hypoxemia, hyperventilation, tendency toward marked tachypnea, tachycordia, hypotension and collaptoid states are observed. Because of the protracted course of the pneumonia process, there is slow recovery of functional capabilities of the respiratory and hemodynamic systems. A case history is presented to illustrate these characteristics of pneumonia related to beryllium compounds. Treatment with a good response is obtained only with prolonged combined sulfanilamide and antibiotic therapy in conjunction with anti allergic, bronchodilating and cardiovascular agents.##

04603L 60

J. Cholak, R. A. Kehoe, and L. J. Schafer

TOXIC HAZARDS OF BERYLLIUM PROPELLANT OPERATIONS (CRITIQUE OF CURRENT SAFETY PRACTICES. Cincinnati Univ., Ohio Kettering Lab., (Rept. No. AMRL-TDR-64-75.) Sept. 1964. 52 pp.
DDC: AD 450 928

The soundness of the considerations which have been used to develop current safety practices in the handling of beryllium enriched propellants have been reviewed. The report includes a discussion of pertinent facts relating to berylliosis and the considerations which led to the promulgation of the tolerance limits. Particular emphasis is given to potential hazards arising from plant operations and test firings. Except for certain measures, industrial hygiene practices are described in general terms. The exceptions, dealing with locker and shower room facilities, protective clothing, laundering of clothing, the use of personal respiratory devices, and the disposal of solid and liquid wastes are discussed in some detail. Medical surveillance programs are outlined in full. The report concludes with a number of recommendations derived from current observations and past experience in the handling of beryllium enriched material.##

06289 61

J. Cholak, R. A. Kehoe, L. H. Miller, F. Princi, and L. J. Schafer

TOXICITY OF BERYLLIUM (FINAL TECHNICAL ENGINEERING REPORT). (Kettering Lab., Cincinnati Univ., Ohio) (Apr. 1962). 76 pp. (Rept. No. ASD-TR-62-7-665.)

This report based on current knowledge and experience has been prepared as a review and as a guide for use by individuals who have the responsibility for protecting the health of personnel engaged in operations in which beryllium is used. The report includes descriptions of the effects of the absorption of beryllium and specific measures designed to prevent illness and maintain health among persons who work with beryllium. The report covers the history of beryllium disease, hygienic standards, environmental control procedures, sampling and analytical procedures, housekeeping, personal hygiene and plant sanitation, and a medical program. Illustrations of ventilation controls are included.##

05222 62

J. J. Cohen, and R. N. Kusian

THE SIGNIFICANCE OF BERYLLIUM SURFACE CONTAMINATION TO HEALTH. California Univ., Livermore, Lawrence Radiation Lab., May 28, 1964. 10 pp. (Rept. No. UCRL-7903.)

Surface contamination with beryllium becomes a hazard to health only when the potential exists for resuspension in air in enough quantity and for enough time to exceed the prescribed standards for airborne exposures. There are several factors governing the rate and nature of resuspension phenomena. These factors include: the quantity and properties of the particular beryllium compound causing the contamination, the nature of the surface, activities in the vicinity, ventilation in the area which might affect the dilution of resuspended particles, and the presence of other control measures such as respiratory protection and use of wet methods. Experience at Lawrence Radiation Laboratory has shown it to be extremely difficult to correlate the amount of beryllium surface contamination to the potential health hazard in a meaningful manner. Because of the many variables affecting potential beryllium exposures due to surface contamination, it is perilous to attempt expression of its significance quantitatively. Generally, it has been found that the problem is minimal and can be easily controlled by exercising good judgment based upon consideration of pertinent factors governing resuspension, and a knowledge of the nature of beryllium toxicity. (Author abstract)

01084 63

L. F. Dieringer

HEALTH CONTROL PROGRAM IN A BERYLLIUM FACILITY: 3 YEARS' EXPERIENCE. J. Occupational Med. 7, (9) 457-60, Sept. 1965.

A beryllium machining facility was designed from an occupational health standpoint and to meet state health standards for the protection of the workers and the community. Results of the monitoring program over a 3-year period were tabulated by operation, for in-plant sampling, and by month, for out-plant sampling. Although various troubles have been encountered in the operation of the facility, to date no hazardous exposures have been indicated by the monitoring program nor any abnormal illnesses uncovered by the medical control program. (Author summary)##

01953 64

H. M. Donaldson

BERYLLIUM, 1964 - TOXICITY AND HANDLING. Arch. Environ. Health 10, 554-9, Apr. 1965. (Presented at the 29th Annual Meeting, Industrial Hygiene Foundation, Mellon Inst., Pittsburgh, Pa., Oct. 21-22, 1964.)

The author's conclusions concerning the hazards of beryllium workers are as follows: Controls and technology in beryllium processing have advanced, but potential toxicity problems are still present. Potential dermatitis still exists when skin contact is made with soluble salts of beryllium, principally the fluoride. Accidental exposure to fumes of beryllium-fluoride may still result in chemical pneumonitis. Chemical pneumonitis responds promptly to therapy apparently without permanent injury, even in serious cases. By 1964, engineering controls were sufficiently developed to prevent berylliosis. Where these controls break down, medical science has advanced to the point where berylliosis can be detected early before disability occurs. When discovered in such an early stage and treated, these cases can be arreated. With adequate engineering and medical controls, beryllium in its many forms can be handled safely in large quantities without fear of producing chronic disabling disease.##

05682 65

Hannon, J. W. G. W. C. Copper, J. E. Martin, Jr. G. W. H. Schepers, H. Tebrock, H. S. Van Crdstrand, R. A. Whitehead, and J. F. Zielinski

BERYLLIUM DISEASE. Diseases Chest 48 (5), 550-8 (Nov. 1965).

The physical and chemical characteristics of beryllium are discussed. A summarization is given of the sources, refining, and industrial uses of beryllium. Berylliosis is defined, and the acute and chronic forms are delineated. Acute beryllium disease is described in terms of respiratory, dermal, and acular manifestations; dermal manifestations are further refined to include contact dermatitis, allergic dermatosis, chemical ulcer, and ulcerating granuloma. The discussion of chronic beryllium disease encompasses respiratory, dermal, renal, and skeletal manifestations. Aspects of industrial hygiene and the occurrence of berylliosis are also treated.

01846 66

R. L. Harris

DUST HAZARDS RELATED TO HEALTH. Preprint. (Presented at the 1955 National Safety Congress)

The relationships between exposures to dusts and their effects upon health are not fully known. Completely satisfactory methods for the assessment of exposures are not yet proved or in use.

Precise definition of the cause-and-effect relationships in the pneumoconioses is especially difficult because disease may first appear a number of years after initial exposures. This discussion reviews some of the relationships between dust hazards and health by considering the nature of dusts, the way the respiratory system copes with dust particles, which are inhaled, some of the aspects of sampling to measure degree of exposure, and some of the effects on health which may result from excessive exposures. (Author abstract)##

00308 67

H. Heimann

EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. World Health Organization Monograph Ser., No. 46 (Air Pollution), p. 159-220, 1961.

As one chapter of a WHO Monograph on "Air Pollution," this paper covers the state of knowledge and world trends in research on the effects of such pollution on human health. The acute air pollution episodes in the Meuse Valley, Donora, London, and Poza Rica are reviewed. Data, causes, and effects for each episode are discussed. The symptoms of illness and organic and systemic effects resulting from major pollutants such as carbon monocide, sulfur and nitrogen oxides, ozone, beryllium, fluorides, aeroallergens, carcinogens and pesticides are described. Further research to demonstrate that specific pollutants or combinations thereof can cause ill health is urged in order to obtain data to balance health effects against economic aspects for the purpose of clearing the air. The maximum allowable concentrations for community air, published by the Russians, are considered inadequate to solve the air pollution problem. However, studies already made of the effect of low-level concentrations have been used as a base, despite controversy, to reduce pollution in many locations.##

07423 68

Heimann, H.

STATUS OF AIR POLLUTION HEALTH RESEARCH, 1966. Arch. Environ.
Health, 14(3):488-503, Mar. 1967. 178 red
Health, 14(3):488-503, Mar. 1967. 178 refs. (Presented in part before the American Industrial Hygiene Conference, Pittsburgh, Pa., May 16-20, 1966.)

Consideration is limited to man-made air pollutants, omitting naturally occurring adventitious airborne materials. Radioactive materials were not discussed. Acute episodes of air pollution; systemic effects of air pollution caused by arsenical compounds, mercury, beryllium, lead, carbon monoxide, economic poisons, manganese, and asbestos; air pollutants as irritants; medical conditions such as acute nonspecific upper respiratory disease, chronic obstructive ventilatory diseases, chronic bronchitis, pulmonary emphysema, bronchial asthma, and lung cancer, are reviewed.##

02288 69

W.C. Hueper

ENVIRONMENTAL AND OCCUPATIONAL CANCER HAZARDS. PART I OF SYMPOSIUM: CHEMICAL CARCINOGENESIS. Clin. Pharmacol. Therap. 3, (6) 776-813, Dec. 1962

The growth of an environmental carcinogenic spectrum composed of recognized, suspected, and potential human carcinogens of chemical, physical, and parasitic nature should provide an impressive warning to all concerned with the maintenance and protection of the health and well-being of mankind to exert all possible effort to develop methods and facilities by which sources of production, channels of dissemination, routes of exposure, prospective and actual target organs and tissues, and number and types of individuals exposed to natural and man-made carcinogens can be more readily and reliably identified. It is essential that, where possible, human contact with environmental carcinogens be totally eliminated or, whenever such a stringent measure appears impractical or impossible, reduced to a minimum with respect to degree, frequency, duration, and number of persons exposed. While the presently available methods of identifying carcinogenic agents are admittedly slow and not totally adequate, experimental observations and their implications in man demand that first and dominant consideration be given to the protection of the community against actual or potential cancer hazards. In such a decision, the health and life of the general public should receive the benefit of doubt without any reservation. (Author summary modified)##

21225 70

Johnson, Kenneth D.

THE BERYLLIUM OXIDES OF PROPELLANT FUME: OUR KNOWLEDGE OF THEIR PHYSICO-CHEMICAL AND TOXICOLOGICAL PROPERTIES. Preprint, Armed Services Explosives Safety Board, Huntsville, Ala. 22p., 1966. 16 refs. (Presented at the Armed Services Explosives Safety Board, Explosive Safety Seminar on High Energy Propellants, 8th, Huntsville, Ala., Aug. 9-11, 1966.)

The National Research Council standards for exposure to beryllium oxide arising from rocket motor firing are reviewed and their applicability to actual test firings evaluated. Three considerations were the physical and chemical properties of the two reference oxides specified in the standards; the reasons for the selection of these particular forms of the oxide as reference compounds; and the similarity of propellant combustion oxides to them. Several series of toxicological tests on dogs and rabbits using rocket combustion products are reviewed. It is concluded that not enough is known concerning the relationship between physico-chemical properties of the exhaust oxide and the parameters of motor burning to permit the application of the proposed 'relaxed' standards to be applied. However, it will be difficult to predict that a test can be conducted in conformance with National Research Council standards. Neither will it be possible, with assurance, to demonstrate, on a posterior basis, that these standards have in fact been met.

20055 71

Karamzina, N. M.

EFFECT OF BERYLLIUM OXIDE AND BERYLLIUM ALLOYS WITH ALUMINUM ON GLYCOLYSIS IN THE LUNG. (K otsenke sostoyaniya glikoliza v legochnoy tkani pri vozdeystvii okisi berilliya i ego splava). Text in Russian. Toksikol. Novykh Prom. Khim. Veshchestv, no. 9:193-198, 1967. 4 refs.

Intratracheal introduction of beryllium oxide and of a beryllium-aluminum alloy resulted in a sharp increase in lactic acid in the rat lung tissue. A certain depression of hexokinase activity in the lung tissue was detected. These tests did not reveal any change in activity of dehydrogenase for phosphoglycerine aldehyde. Changes brought about by beryllium-aluminum alloy were in every case weaker and more rapidly normalized than with beryllium oxide. This is in agreement with data related to weighted pulmonary quotient.

20621 72

Kotin, Paul and Hans L. Falk

ATMOSPHERE POLLUTANTS. Ann. Rev. Med., vol. 15:233-254, 1964. 109 refs.

The effects of acute air pollution disasters on morbidity and mortality are documented, and observations during and following these episodes serve as guidelines for research aimed at determining whether sub-lethal or even sub-threshold levels of air pollution represent a hazard to health. Analysis of the Meuse Valley, Poza Rica, Donora, and 1952 London episodes reveals that the aged and persons with chronic cardiac or respiratory disease are at maximum risk as their threshold of response is lower, and the frequent association of fog with atmospheric stasis suggests that both gases and aerosols contribute to the morbidity with the latter having a more pronounced effect. The chronic and intermittent subdisaster exposures of Los Angeles, Tokyo-Yokohama, and New Orleans are investigated in relation to symptoms produced, and the pathological effect of air pollutants is discussed in terms of their physical and chemical state in the atmosphere.

00093 73

V.M. Kozlov V.D. Turovskiy

BERYLLIUM: TOXICOLOGY, CLINICAL ASPECTS OF DISEASES, LABOR HYGIENE. (Berilliy: toksikologiya, klinika porazheniy, gigiyena truda.) State Publishing House for Literature in the Field of Atomic Science and Technology, Moscow. Translated from Russian. Dec. 3, 1962. 120 pp.
CFSTI, DDC: AD 299754

This report is a translation of parts of the Russian-language book by Koziov and Turovskiy: toksikologiya, klinika porazheniy, gigiyena truda. The following chapters are included: (1) Experimental Toxicology of Beryllium and Its Compounds; (2) Labor Hygiene i Working with Beryllium; (3) Protection of the External Environment from Beryllium Contamination.##

05044 74

V. M. Kozlov, and V. D. Turovskiy

BERYLLIUM TOXICOLOGY, SYMTOMATOLOGY OF AFFECTIONS AND INDUSTRIAL HYGIENE. (Berilliy Toksikologiya, Klinika Porazheniy, Gigiyena Truda.) Air Force Systems Commond, Wright-Patterson AFB, Ohio, Foreign Technology Div. 162 (Oct. 24, 1963). Russ. (Tr.)

The book describes the problems of the toxicology of beryllium, the symptomatology of affections caused by the action of this compound, industrial hygiene for beryllium production, and the protection of the environment from contamination with production wastes. Sanitary-hygienic requirements have been worked out for the designing of production areas, for the various types of equipment used, and for industrial ventilation systems. The sanitary-hygienic requirements described in this book apply primarily to the production of beryllium and components fabricated from this metal and to enterprises or shops which produce beryllium-rich alloys of other metals. These requirements cannot be completely extended to the production processes by which alloys containing only small quantities of beryllium are obtained and to work associated with the fabrication of components from such alloys. The book is for a wide range of medical specialists, engineering and technical inspectors from the professional associations, and workers employed in beryllium production.##

01527 75

C.J. Leadbeater

BERYLLIUM. J. Roy. Aeron. Soc. (London), 70(668):781-787, Aug. 1966.

Persons involved in handling certain forms of beryllium are liable to respiratory illness and specific skin reactions. The serious symptoms of berylliosis, the respiratory disease, result from the inhalation of beryllium compounds such as fluoride or sulfate. Inhalation of finely dispersed BeO also gives rise to the disease. The mild form of reaction to beryllium occurring in sensitive individuals, is a contact dermatitis caused by handling beryllium and its compounds. The resultant rash disappears when contact with the beryllium compound ceases. The presence of fine beryllium dust with its associated oxide, or independent oxide particles must not be tolerated and basic precautions are essential for the maintenance of health and safety. The statutory maximum atmospheric concentration is 2 micrograms per cubic meter averaged over an 8-hour day and 25 micrograms per cubic meter as the maximum concentration which may not be exceeded even for a short time. Strict controls apply also to stack effluents and wastes. Experience in several establishments on this problem has proved that good housekeeping by the confinement of dust by means of effective ventilation systems, collection of dusts, scrupulous cleanliness by personnel and equipment can remove the risk in beryllium technology. This report stresses the mechanical properties and metallurgical processing of beryllium.##

21226 76

Lehman, Arnold J., Horace W. Gerarde, Verald K. Rowe, Henry F. Smith, Jr., Herbert E. Stokinger, and William L. Sutton

AIR QUALITY CRITERIA FOR BERYLLIUM AND ITS COMPOUNDS. National Academy of Sciences-National Research Council, Washington, D. C., Committee on Toxicology and the Advisory Center on Toxicology. Contract N7onr-291(61), 13p., March 1, 1966.

The toxicity and hazards of beryllium and its compounds were studied to obtain a data base from which to make recommendations for the establishment of air quality criteria. The toxic effects, including both acute and chronic beryllium disease, are discussed. Acute chemical Pneumonitis is dose related and produced by exposure to mists, fumes and/or dust of soluble beryllium compounds. Recovery is usually spontaneous after removal from the contaminated atmosphere. The pathogenesis of chronic beryllium disease is still unknown. The fact that only a small percentage of the persons exposed develop the disease lends support to the hypothesis that there is an immunological abnormality associated with the disease, or that the susceptibility is in some way related to an inborn error of metabolism. The lung is the primary target organ of chronic beryllium disease; there is a latent period between exposure and the appearance of the disease which varies from months to as long 23 years. The total exposed population is unknown, but the Beryllium Registry shows over 400 cases of chronic beryllium disease from industrial and approximately 60 cases from non-industrial exposure. A relationship exists between the thermal history of beryllium oxide and its toxicity; the oxide calcined at 1350 C was virtually non-toxic, whereas material calcined at 1100 C and 400 C caused a progressive increase in mortality with decreasing calcining temperature. With respect to particle size, crystallinity, and density, the physical-chemical properties produced from rocket motor test firings are strikingly similar to the oxide formed by calcining at 1600 C. The need for analytical methods capable of differentiating between soluble and insoluble beryllium compounds and identifying individual insoluble compounds was brought out. Continuation of the existing limit of 0.01 micrograms/sq m averaged over 30 days for continuous exposure was recommended. A series of air quality criteria for intermittent exposure to soluble beryllium compounds and to beryllium oxide were recommended.

01925 77

J. Leiben, J. A. Dattoli, and V. M. Vought

THE SIGNIFICANCE OF BERYLLIUM CONCENTRATION IN URINE. Arch. Environ. Health 12, 331-4, Mar. 1966.

Fifty urine samples were obtained from cases of berylliosis, suspected cases of berylliosis, beryllium workers without berylliosis, family contacts of berylliosis patients, and from neighbors of a beryllium refinery. Some persons had very high exposures over a prolonged period of time while others had short exposures. From a study of the results of these urine examinations it can be concluded that: 1. Quantitative or qualitative analysis of urine does not appear to be an aid in the diagnosis of berylliosis. Ther were ten cases of berylliosis in this group and seven suspected cases. Of these, only one had a positive urine. Three beryllium workers who had heavy exposure but no disease also had a positive urine sample. 2. Community air pollution above Atomic Energy Commission suggested levels does not cause beryllium excretion in the urine. Of 14 persons who lived within one-quarter mile of a beryllium refinery for at least 18 years only two excreted beryllium in their urine, and both had drunk beryllium contaminated water in the past.##

01314 78

B.M. Levy G.M. Higgins

REACTIONS WITHIN THE LUNGS OF GUINEA PIGS TO THE INTRATRACHEAL ADMINISTRATION OF ZINC BERYLLIUM SILICATE. Am. Ind. Hyg. Assoc. J., Vol. 26:227-235, June 1965.

Zinc silicate and zinc beryllium silicate were injected intratracheally into two groups of guinea pigs. Serial sacrifice of the animals was made and the pathology of lesions of the lungs was studied. Zinc silicate produced lesions comparable to but less severe than those from zinc beryllium silicate. Lesions from zinc silicate reached maximal intensity in about eight weeks; thereafter, recovery was noted and at 14 months a normal pulmonary parenchyma was restored. The beryllium salt produced more advanced lesions in two weeks with progression for three or four months. At 15 months some residual injury remained. (Author abstract)##

13625 79

Lindberg, Walter

AIR POLLUTION IN NORWAY. II. PUBLIC HEALTH ASPECTS OF AIR POLLUTION - A LITERATURE STUDY. (Den Alminnelige Luftforurensning i Norge. Luftforurensning som Helseproblem, - en Litteraturstudie.) Translated from Norwegian. Oslo Univ. (Norway), p. 66-77, 1968.

This presentation discusses functional and anatomical changes arising from diseases caused by air pollution. The discussion includes air pollution episodes, pollutants known to cause specific effects (arsenic compounds, mercury, beryllium compounds, manganese compounds, and lead). Lead and carbon monoxide are discussed in greater detail. Emphasis is also placed on respiratory irritations caused by SO2, nonspecific upper respiratory diseases, the effect of air pollution on the occurrence of colds, smoking, chronic bronchitis emphysema, bronchial asthma, lung cancer, and heart disease.

07328 80

V. Macquet, F. Guerrin, M. Leduc, D. Furon

REVIEW OF A CASE OF CHRONIC PULMONARY BERYLLIOSIS. ((A Propos d'un Cas de Berylliose Pulmonaire Chronique.)) Text in French. Lille Med. (Lilli), 12(2):246-252, Feb. 1967. 27 refs.

A case of chronic pulmonary berylliosis was followed from 1963 to 1967 and the gradual deterioration of the patient's condition is reported. The patient born in 1920 was first seen in regard to a complaint of dyspnea which had bothered the woman since 1957 following influenza. The woman was exposed to clouds of fluorescent powder in the mixing of powders containing beryllium and in cleaning out the powder from defective tubes. The occupational history, the clinical picture, the X-ray plates, and the association with a definite reaction to a patch test confirmed the diagnosis of chronic pulmonary berylliosis. Cortisone therapy gave temporary improvement, but extended cortisone therapy did not change the prognosis. The general health of the patient deteriorated with the dyspnea increasing on the least effort. There was a frequent cough and a general weakness. In 1967, the lips were cyanotic and nails were deformed. The pulmonary fibrosis increased slowly.
Becuase of the failure to comply with the 5-year limit on the filing of claims after leaving employment, the case was not compensable under French law. The 5-year limit is not sufficient especially in cases involving berylliosis.##

07098 81

Noro, L., V. Pirila, and A. Laamanen

AIR POLLUTION AND ALLERGY. (Work Environ. Health (Helsinki),) Vol. 1, p. 2-15, Oct. 1962.

The authors current knowledge regarding the problem of air pollution and allergy is reviewed and observations made in Finland are presented. Air pollution is divided into natural and cultural the former deriving from wind pollinated plants and the latter from industrial sources. Emphasis is on cultural pollution and major pollutants such as SO2, beryllium, and fluorine are treated individually. It is pointed out that there is a disparity between maximum allowable concentrations, as commonly set, and concentrations tolerated by allergic individuals.##

06974 82

Pinkerton, M. K. and R. F. Ziegler

EFFECTS OF BERYLLIUM SULFATE ON SERUM ALKALINE PHOSPHATASE IN PRIMATES. Aerospace Medical Research Lab., Wright-Patterson AFB Ohio, Proj. 6302, Task 630202, AMRL-TR-66-198, (11)9., Dec. 1966. 2 refs.
CFSTI: AD 650372

The effects of intratracheally administered beryllium sulfate on serum alkaline phosphatase were studied in male Macaca mulatta monkeys. Forty male Macaca mulatta monkeys weighing from 2.0 to 5.2 kg were used in this investigation. Twenty-two monkeys received beryllium sulfate, 10 received aluminum sulfate, and 8 received saline. They were allowed food and water ad libitum and were maintained in individual cages throughout the experiments. Time intervals selected for studying the effects of intratracheal injections of the compounds on serum alkaline phosphatase were 2, 4 8, and 24 hours. Each timed study involved at least one monkey serving as a saline control. All animals were bled before injection for baseline determination of serum alkaline phosphatase so that each animal served as his own control. All beryllium-treated animals received 2 mg/kg Be++. In additional experiments using aluminum sulfate under identical conditions, no inhibition of serum alkaline phosphatase was noted.##

02457 **83**

J.R. Prine, S.F. Brokeshoulder, D.E. McVean, F.R. Robinson

DEMONSTRATION OF THE PRESENCE OF BERYLLIUM IN PULMONARY GRANULOMAS. Am. J. Clin. Pathol. 45, (4) 448-54, Apr. 1966.
CFSTI,DDC: AD634822

Chronic beryllium disease was induced experimentally in dogs, and the presence of beryllium was demonstrated in specific histologic structures (pulmonary granulomas) by means of a laser microprobe and emission spectroscopy. The ability to detect minute amounts of beryllium in tissue sections of necropsy and biopsy material can be a significant aid in the diagnosis of both acute and chronic forms of beryllium disease. The detection of beryllium in histologic structures represents an important advance in the study of the pathogenesis of this disease. (Author summary)##

02275 **84**

A.L. Reeves

THE ABSORPTION OF BERYLLIUM FROM THE GASTROINTESTINAL TRACT. Arch. Environ. Health 11, 209-14, Aug. 1965.

During daily ingestion of $BeSO_4$ in doses of 0.6 microgram-6.6 microgram/day by rats most of the ingested beryllium, presumably precipitated in the intestines as the phosphate, passed the gastrointestinal tract unabsorbed. The daily fecal Be output came to a peak during the first exposure week, decreased temporarily, and reached a plateau somewhat below the intake level during the ninth week of exposure. Urinary Be concentration, generally in the range below 1% of the fecal level, fluctuated during the first several weeks and decreased to a trace six to nine weeks after commencement of the experiments. Most of the retained beryllium accumulated in the bones and some in the liver. However, up to 24 weeks after commencement of exposure, subcellular fractionation studies of proteins and lipids on liver tissue did not show evidence of hepatic cell destruction. A slight inhibition of growth, dependent in extent on the exposure level, was demonstrated. (Author summary)##

09040 85

Reeves, Andrew L.

ISOZYMES OF LACTATE DEHYDROGENASE DURING BERYLLIUM CARCINOGENESIS IN THE RAT. Cancer Res., Vol. 27, Part 1, p. 1895-1899, Oct. 1967. 42 refs.

Starch gel zymograms of lactate dehydrogenase in the pulmonary tissue extract of rats exposed daily to the inhalation of $BeSO_4$ aerosol showed well-defined differences in comparison to paired controls. Significant increase of both the muscle-type and heart-type isozymes was observed during the immediate precancerous phase (8th-10th month of exposure), followed by return to normal or subnormal levels at the time of appearance of the fully grown pulmonary tumors (12th-13th month). H4-lactate dehydrogenase (LDH), but not M4-LDH, was significantly depressed in tumor tissue both in comparison to controls or to the nonneoplastic parts of the exposed lungs. Since beryllium salts inhibit the activity of LDH in vitro, these results show that a reversal of the direct effect takes place during the malignant transformation, followed in part by a second reversal during tumor growth. (Author's summary)##

06168 86

Reeves, A. L. D. Deitch, and A. J. Vorwald

BERYLLIUM CARCINOGENESIS: I. INHALATION EXPOSURE OF RATS TO BERYLLIUM SULFATE AEROSOL. Cancer Res. 27, (3) 439-43, Mar. 1967.

The results of an inhalation exposure of 150 rats for 72 weeks at a mean concentration of 34.25 micrograms of Be/cu m in the form of a beryllium sulfate aerosol are reported. The average lung weight towards the end of the exposure was 4.25 times normal. The two gradually developing pathologic processes were: an inflammatory response characterized by an accumulation of histiocytic elements forming clusters of macrophages in the alveolar spaces and also a proliferative response, progressing from early epithelial hyperplasia of the alveolar surfaces, through metaplasia and anaplasia to lung cancer. The first tumors were found in 9 months and the incidence was 100 percent in 13 months. All tumors were alveolar adenocarcinomas with some focal intermixture of other types. Three of 56 tumors reached a very large size comparatively early. Females appeared to be more vulnerable to the exposure than males in terms of attritional mortality and body weight loss. It is recalled that the attack rate of indutrial berylliosis in humans is also higher in women than in men.

06164 87

A. L. Reeves and A. J. Vorwald

BERYLLIUM CARCINOGENESIS: II. PULMONARY DEPOSITION AND CLEARANCE OF INHALED BERYLLIUM SULFATE IN THE RAT. Cancer Res. 27, (3) 446-51, Mar. 1967.

The deposition and clearance of the $BeSO_4$ from a group of rats exposed to 34.25 micrograms of beryllium per cubic meter for 72 weeks in the form of a beryllium sulfate aerosol is reported. At 36 weeks there was a concentration plateau which was interpreted as an equilibrium between deposition and clearance. The clearance mechanisms included not only the solubility of intrapulmonary precipitates, but also certain host-dependent factors involving the lympatic route primarily. Females were less efficient in utilizing this clearance route which resulted in slower removal of pulmonary Be deposits, lower accumulation of inhaled material in the regional lymph nodes, and earlier morbidity and mortality. Only about half of the original pulmonary load was cleared rapidly; the remainder remained in the lungs for longer periods and later became incorporated into the nuclei of certain pulmonary cells and was involved in carcinogenic challenge. The beryllium assays made by spectrographic beryllium analysis are reported for the lungs, tracheobronchial lymph nodes, and blood. The ultimate site of beryllium in the organism appears to be the skeleton, although temporary deposits were noted in the liver. The inhaled beryllium which is retained in the lungs for long periods is of the greater significance from the viewpoint of pulmonary carcinogenesis.##

11000 88

Robinson, Farrel R., Fenton Schaffner, and Esther Trachtenberg

ULTRASTRUCTURE OF THE LUNGS OF DOGS EXPOSED TO BERYLLIUM-CONTAINING DUSTS. Arch. Environ. Health, 17(2):193-203, Aug. 1968.

Two beagle dogs were exposed by the natural respiratory route to rocket exhaust fumes containing beryllium oxide, beryllium fluoride, and beryllium chloride. The lung tissue was examined electron microscopically after a three-year post-exposure period. Beryllium particles and small agglomerates less than 1 micron in size were deposited in lysosomes in the cytoplasm of histiocytes in the interstitium of the septa. They were closely associated with collagen bundles several microns wide and with increases in numbers of septal capillaries. The lesions were more typical of the classical reaction to a foreign-body than immunologic in character and represented an early form of chronic beryllium disease. (Authors' abstract)##

11241 89

E. M. Roth, W. H. Teichner, and A. O. Mirarchi

CONTAMINANTS STANDARDS. (SECTION 13.) In: Compendium of Human Responses to the Aerospace Environment, Volume III, Sections 10-16, Emanuel M. Roth (ed.), Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., CONTRACT ¬NAS-115, p. 1-115, Nov. 1968. 233 refs.
CFSTI: NASA CR-1205(III

Toxicological problems in space operations cover three situations: (1) the acute, short term, high-level exposure either in ground support or space cabin conditions; (2) the 8-hour work day exposure found in manufacturing and ground support situations; and (3) continuous, long term exposure to trace contaminants, such as would be anticipated in extended space missions. In view of the necessity for provisional limits of manned space flights of 90 to 1000 days duration the following criteria for trace contaminant control in manned spacecraft have been derived: Contaminants must not produce significant adverse changes in the physiological, biochemical, or mental stability of the crew. The spacecraft environment must not contribute to a performance decrement of the crew that will endanger mission objectives. The spacecraft environment must not interfere with physical or biological experiments nor with medical monitoring. Based on these criteria air quality standards for prolonged manned missions have been established. The following topics are discussed: kinetics of contaminants in space cabins; toxicological factors; toxicology in the spacecraft environment; source of contaminants; particulates and aerosols; microbial contaminants. Tables presenting chemical analysis of all contaminants with standard levels for space cabins are listed.##

09900 90

Sherwin, Russell P., Reginald H. Smart, and Gerald C. Scarborough

CHRONIC BERYLLIOSIS AND CALCOSPHERITE DEPOSITION. Arch. Environ. Health, 12(2):237-245, Feb. 1966. 8 refs.

A 24 year-old Caucasian woman had a five-year period of exposure to beryllium dust just prior to the onset of her respiratory symptoms. After discontinuing her occupation her subsequent clinical course was characterized by a progressive increasing shortness of breath, which 13 years after the onset of her illness, necessitated continuous oxygen therapy. She also developed a productive cough and orthopnea. The clubbing and cyanosis of the fingernails which began one year after onset of illness was now pronounced. Examinations revealed an enlarged heart with a murmur and resonant positive. Twenty years after onset of disease, the patient died. Autopsy findings showed numerous clusters of calcospherites within all lobes of both lungs. The autopsy examinations also supported a beryllium pneumoconiosis in that multiple fibrocologenous nodules were found which are consistent with healed beryllium granulomas. The calcospherite deposits overshadowed the old granulomas both pathologically and clinically.

08662 91

Smith, N. J. and R. P. Tessner

THE ANALYSIS OF TRACE METALS IN BIOLOGICAL SPECIMENS BY A DIRECT READING SPECTROMETRIC TECHNIQUE. Preprint, Dow Chemical Co., Midland, Mich., Chemical Physics Research Lab., ((15))p., 1966. (Presented at the American Industrial Hygiene Conference, Pittsburgh, Pa., May 16-20, 1966.)

The sensitivity of direct reading versus photographic recording wa investigated. The method decided upon to test the direct reader was the analysis of animal organs for Be, Ca, Mg, and Fe. The animals were intratracheally treated with BeO. At intervals ranging from 1 to 68 weeks the animals were killed and the tissues were saved for elemental analysis, among other tests. The whole organs were removed from the animals, weighed, wrapped in Saran Wrap and frozen. The best method found to digest the samples was to wet ash the whole organs in a 3:2 mixture of HC104 and HNO3 acids. The photoelectric recording is slightly more precise than the photographic method. Constant light data indicate the recorder is precise to less than 1 percent. This infers that the lack of precision is due to something other than recording. The Be concentrations increase with respect to time. This procedure was set up using the direct reader head to indicate what success could be expected in making trace analysis by direct reading methods. From the results of this work justification is felt for setting up a more general direct reading method for the analysis of trace elements.

03086 92

P. Stocks

ON THE RELATIONS BETWEEN ATMOSPHERIC POLLUTION IN URBAN AND RURAL LOCALITIES AND MORTALITY FROM CANCER, BRONCHITIS AND PNEUMONIA, WITH PARTICULAR REFERENCE TO 3:4 BENZOPYRENE, BERYLLIUM, MOLYBDENUM, VANADIUM AND ARSENIC. Brit. J. Cancer (London) 14, 397-418, 1960

Lung cancer mortality is strongly correlated with smoke density in the atmosphere in Northern England and Wales. In 26 localities, the smoke samples were analysed in respect of polycyclic hydrocarbons and a statistical process of

lung cancer mortality is strongly correlated with smoke density in the atmosphere in Northern England and Wales. In 26 localities the smoke samples were analysed in respect

successive elimination was applied to discover which hydrocarbon was responsible for the smoke correlation with mortality rates. For lung cancer and bronchitis 3:4 benzopyrene emerges clearly as the substance of prime importance, with 1:12 benzoperylene contributing weakly for lung cancer, but for pneumonia 3:4 benzopyrene is apparently not important. The composite group of other cancers in males is correlated with several hydrocarbons, but cancers of the breast and other sites in females show no relations with any of them. In 23 localities spectrographic analyses for 13 trace elements were made and a similar process of successive elimination was applied to those which showed appreciable correlations with mortality rates. For lung cancer beryllium and molybdenum emerge as the elements of most consequence, with arsenic, zinc and vanadium showing weaker associations. For bronchitis molybdenum appears to be the important element in both sexes whilst males beryllium, arsenic, vanadium and zinc may also be concerned as for lung cancer. For pneumonia beryllium emerges as the important element in both sexes, with vanadium also concerned in males. With other cancer in males beryllium, molybdenum and vanadium show associations, but breast and other cancers in females show no realtions with any element. (Author summary modified)##

16739 **93**

Stokinger, Herbert E.

THE SPECTRE OF TODAY'S ENVIRONMENTAL POLLUTION--USA BRAND: NEW PERSPECTIVES FROM AN OLD SCOUT. Am. Ind. Hyg. Assoc. J., 30(3): 195-217, May 1969. 128 refs.

A comprehensive toxicologic evaluation of the potential human health hazards from man-made and natural environmental pollutants (except radiation) from air, water and food has been made to highlight the areas of greatest concern for health agencies in the U.S.A. The judgments are predicated on pollutant levels existing now or in the foreseeable future, and on the hereditary milieu of the population of the continental United States. (Author's Summary)

04738 **94**

A. A. Thomas

AEROSPACE TOXICOLOGICAL RESEARCH. Proc. NATO AGARD Conf. (Paris) (2) 259-78, Sept. 1965.

The major areas of aerospace toxicology such as propellant toxicology, environmental pollution, and space cabin environment are reviewed. Because of the short duration, high level, and infrequent exposures, the industrial Threshold Limit Values are meaningless. The philosophy of emergency exposure assumes that no one will be intentionally exposed to high concentrations of propellant vapors under ordinary conditions; if there is exposure, subjective and objective symptomatology may occur, but pathology should be reversible and the performance of the operator must not be impaired. Valuable information from the aerospace toxicological research projects include: exposure data that can be applied to community air pollution problems, new high-energy propellants which are potential pharmacological research tools, and a better understanding of the oxygen toxicity problem.##

14017

Vasilieva, E. V.

IMMUNOLOGICAL ASSESSMENT OF A MODEL OF EXPERIMENTAL BERYLLIOSIS. (Immunologicheskaya otsenka modeli eksperimental'nogo berillioza). Text in Russian. Byul. Eksperim. Biol. i Med., 67(3):74-77, 1969. 11 refs.

Rats were administered 2.5 mg of beryllium oxide intratracheally to test their immunological reactivity. The results showed that morphological changes due to berylliosis were accompanied by a skin reaction to soluble beryllium compounds and by the formation of humoral and sessile antibodies to lung nucleoproteins. The immunological activity of the rats resembles that of animals with chronic berylliosis and can serve as an experimental model of chronic berylliosis. (Author summary modified)

EFFECTS – PLANTS AND LIVESTOCK

00316 **96**

A. R. Gregory

EFFECTS OF AIR POLLUTION ON EDIBLE CROPS. North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering. May 1964. pp. 21-3.

The effects of air pollution on edible crops should be differentiated at the onset from the effects of air pollution on vegetation in general. For example, sulfur dioxide has a very pronounced effect on pine needles, but pine needles are a minor food source. It has been variously estimated by different authorities that the annual loss of vegetable produce amounts to 40 to 60 million dollars. Although this over-kill type of damage is very real to the vegetable producer and is of great economic interest, it is of less concern to those in public health. Their concern is with the damage that alters the content s of crops but does not alter the appearance sufficiently to prohibit their sale. This results in threats to public health through the insidious route of the gastro-intestinal tract. The alterations in edible crops that are usually not apparent to the consumer fall into two categories: (1) loss of nutiirnts such as vitamins, proteins, essential fatty acids, etc. and (2) the addition of some substance to the food which is toxic when absorbed from the gastro-intestinal tract. The loss of nutrients has been established in many cases. Some of the substances which have been shown to produce nutrient damage to produce are: ozone, nitroolefins, perocyacyl nitrates, nitrogen oxides, and ethylene. Of probably greater importance to health now and assuredly in the future is the addition of some toxic substance to the produce. With the advent of possible atomic power plants, Be was studied for toxicity and found to be extremely toxic. It was found that Be taken up into bush beans was not only toxic itself, but decreased the Cu content. In this way it fell into the category of primary toxicant and also into the category of nutrient depletor. Many other compounds also fall into both categories. With the many new insecticides, herbicides and larvicides being manufactured, it has become imperative to be aware of the problem of both the effect on edibles of a toxicant and also its effect on the plant, that is, loss of minerals, vitamins, etc.##

06326 **97**

W. W. Heck, L. S. Bird, M. E. Bloodworth, W. J. Clark, D. R. Darling, and M. B. Porter

ENVIRONMENTAL POLLUTION BY MISSILE PROPELLANTS. Texas Agricultural and Mechanical Research Foundation, College Station. Apr. 1962, 120 pp. (Rept. MRL-TDR-62-38.)
CFSTI, DDC: AD 282984

The effects of 21 missile fuel components on aquatic organisms, soil microflora, plants and soils were determined. Goldfish and Daphnia were subjected to 0,1,10,100 and 1000 ppm of the test compounds for 72 hours in the aquatic studies. Some or all of 10 goldfish and 13 Daphnia died, when exposed to 100 ppm of the test chemicals. Counts of bacteria, actinomycetes, and fungi in the soil microflora studies showed no significant decrease in any of the organisms with a 100 ppm application of test chemical to the soil samples. Three of the chemicals may sterilize the soil of actinomycetes. Plant studies were threefold using squash, soybean, cotton, cowpea and corn; germination studies using 1000 ppm of each test chemical produced consistent inhibition of germination by two of the compounds and two ionic species; seedling studies using a soil drench of each test chemical at 100 ppm, produced toxic symptoms with three of the ionic components; seedling studies using three test chemicals (gases) at 100 ppm as air pollutants produced severe injury to death of all species with each of the test gases. Soil studies (1000 ppm) included the leachability and runoff potential of each test chemical as well as the effects on soil. (Author abstract) ##

STANDARDS AND CRITERIA

08420 98

Brodovicz, Bey A.

AIR QUALITY CRITERIA FOR PENNSYLVANIA. J. Air Pollution Control Assoc., 18(1):21-23, Jan. 1968. 4 refs.

In late 1965 the Pennsylvania Air Pollution Commission appointed a Council of Technical Advisors to develop air quality criteria. Recently this Council set forth its recommendations for ten pollutants. The philosophy of the Council is expressed. The major difficulties and rationale are mentioned. The recommendations are given and the potential use of the criteria is also explained. The establishment of firm guidelines of air quality is based solely on consideration of effects both on health and aesthetics. The criteria are broken into two distinct groups; air basin average and single point measurement. The pollutants included: 1. Suspended particulates (total), 2. Settled particulates (total), 3. Lead (tentative), 4. Beryllium, 5. Sulfates (as H2SO4), 6. Sulfuric acid mist, 7. Fluorides (total soluble, as HF), 8. Sulfur dioxide, 10. Oxidants, 11. Hydrogen sulfide, and 12. Carbon monoxide.##

01270 99

M. Katz

QUALITY STANDARDS FOR AIR AND WATER. Occupational Health Rev. (Ottawa) 17(1):3-8, 1965. (Presented at the Occupational Health and Safety Conference, Canadian Congress of Labour, North Bay, Ontario, Nov. 16, 1964).

Author reiterates air quality standards and threshold limit values for gases and vapors (ppm) in the USSR and USA: ambient air quality standards and workroom air threshold limit values for some gases (carbon monoxide, chlorine, hydrogen chloride, ethylene, ozone, oxides of nitrogen and sulfur dioxide); air quality standards and threshold limit values for solids or liquids; and comparative ambient air quality standards for particulate matter. Data are given for California, Oregon, USSR, Czechoslovakia and West Germany.##

06677 100

E. V. Khukrin

MODERN APPROACH TO AIR DUSTINESS IN WORKSHOPS. U.S.S.R. Literature on Air Pollution and Related Occupational

Diseases, Vol. 7, 301-8, 1962. (Gigiena i Sanit.,) 24 (7) 50-5, 1959. Translated from Russian.
CFSTI: 62-11103

Extensive data were accumulated during recent years on the study of the effect of different types of industrial aerosols. Based on the summary and evaluation of new data obtained from work institutes, university apartments and practicing physicians a list was prepared of the maximum permissible concentration of 55 dusts and aerosols. This list is presented and improvements in those standards are recommended.##

08679 **101**

Maga, John A. and J. R. Goldsmith

STANDARDS FOR AIR QUALITY IN CALIFORNIA. J. Air Pollution Control Assoc., 10(6):453-455, 467, Dec. 1960. 8 refs. (Presented at the 53rd Annual Meeting, Air Pollution Control Assoc., Cincinnati, Ohio, May 22-26, 1960.)

The 1959 State legislature required that the California State Department of Public Health adop and publish standards for the quality of the air of the State. The act also provides that the standards may be amended from time to time and that they shall be adopted after public hearings. Concentrations for four substances --ozone, oxides of nitrogen, sulfur dioxide and carbon monoxide-- were established in 1955 by the Los Angeles County Air Pollution Control District as part of an alert system. Following adoption of the State air quality standards, that District amended the carbon monoxide alert values to include a concentration and time of exposure. The procedures for the adoption of the stan dards are detailed. Three levels of air pollutants were thus selected as follows: 1. Adverse Level - Level at which there will be sensory irritation, damage to vegetation, reduction in visibility, or similar effects.2. Serious Level-Level at which there will be alteration of bodily function or which is likely to lead to chronic disease. 3. Emergency Level - Level at which it is likely that acute sickness or death in sensitive groups of persons will occur. The three levels were not merely different degrees of severity but each represents qualitatively different effects. The concentrations that were used represent that was con sidered to be the lowest values at which the defined effect could be experienced by sensitive receptors. The standards that were established by the Department are given. Standards were set only for substances on which it was felt there were sufficient data. In addition, a number of footnotes are included. Some of these footnotes cover substances for which actual standards in the near future. One of the considerations of the Legislature in requiring air quality standards was that they would be used to determine standards for motor vehicle exhaust emissions. The "oxidant index" and carbon monoxide levels in the air quality standards had a direct and important bearing on standards for motor vehicle exhaust emissions that were also developed by the Department.

01041 102

A. Rihm, Jr.

NEW YORK STATE'S CLASSIFICATIONS - AMBIENT AIR QUALITY OBJECTIVES SYSTEM. J. Air Pollution Control Assoc. Vol. 15:(11)519-522, Nov. 1965.

The air pollution potential of any area is directly related to its population and economic development. In New York State, this pollution potential ranges from that existing in the sparsely inhabited recreational zones to that prevailing in the densely populated and/or heavily industrialized areas. No one set of air quality standards or objectives can be developed which can reasonably be applied on a statewide basis. A classifications-air quality objectives system has been adopted by the State Air Pollution Control Board for application in New York State.
In accordance with this system, specific areas can be classified in one of 16 categories. Air quality objectives, in keeping with each classification are designed to protect health and to promote the maximum comfort and enjoyment and use of property consistent with the needs of the area concerned. The system was developed by the staff with the assistance of a council of technical advisors. Units of measurement related to the most important effect of specific contaminants are utilized. Methods of sampling and analysis are specified. The details of the classifications-objectives system, the place of the system in the state's air resource management plan, the manner in which each segment of the state after study will be classified, and how attainment will be evaluated are described. (Author abstract)##

were ignored. The composition of the reactants corresponds to 0.422 Be plus 0.2115 02 plus 0.7885n2 in moles. The properties calculated are for an ideal mixture of pure gases, liquids, and solids. The thermodynamic properties are reported in table form and as a Mollier chart. The compositions are reported in chart form only. In addition, the boiling point, percent condensation of BeO, and the adiabatic flame temperature for various pressures are given. (Author)##

14754 **105**

Marchal, Germaine

RESEARCH ON THE DECOMPOSITION OF METALLIC SULFATES BY HEAT. DISSOCIATION OF MAGNESIUM AND BERYLLIUM SULFATES AND THEIR COMBINATIONS WITH POTASSIUM SULFATE. (Recherches sur la decomposition des sulfates metalliques par la chaleur. Dissociation des sulfates de magnesium, de glucinium et de leurs combinaisons avec le sulfate de potassium). Text in French. J. Chim. Phys., vol. 22:493-517, 1925. 26 refs.

The range of temperatures and pressures was measured from the beginning of the decomposition of magnesium sulfate at 880 to 1175 C. There was a break in the rise of temperature and pressure in the region of 1155-1165 C near the melting point. The melting point was shown to be 1155 C as determined in a special electric furnace. From the temperature-pressure diagrams, it was possible to calculate the partial pressures of sulfur trioxide, sulfur dioxide, and oxygen in the range 950 to 1190 C and the dissociation curve, temperature versus pressure. The reaction heat of decomposition varied from 71 cal between 1000 and 1050 C to 62.3 cal between 1084 and 1100 C. The same types of experiments were done for beryllium sulfate. Decomposition set in at 610 C and proceeded more rapidly at 700 C. Decomposition occurred according to the reaction: 5 BeSO4 yields SO3.5BeO + 4SO3. Again, a curve of pressure versus temperature was recorded between 590 and 830 C. The partial pressures of the gases (SO2, SO3, O2) given off in this range were also determined. The heat of decomposition averaged 41 cal. The double salt of magnesium and potassium sulfates was crystallized from pure single salts. Its melting point averaged 751 C.

16468 **106**

Sastri, M. N. and T. P. Prasad

THERMAL DECOMPOSITION OF BERYLLIUM SULPHATE TETRAHYDRATE. J. Inorg. Nucl. Chem., 30(6):1639-1640, July 1968. 8 refs.

The pyrolitic behavior of beryllium sulfate tetrahydrate was studied. Beryllium sulfate tetrahydrate was dried to a constant weight in a vacuum over a silica gel. About 250 mg was used for the thermogravimetric study. A thermobalance with a sensitivity of 1 mg, linear heating of 4 C/min, and a chart speed of 6 in./hr was used. The differential graph was drawn by plotting the weight loss/5 min against the temperature. The differential curve shows

BASIC SCIENCE AND TECHNOLOGY

14209 103

Bear, I. J.

FURTHER OBSERVATIONS ON THE OCCURRENCE OF METASTABLE PHASES DURING THERMAL DECOMPOSITION OF SULPHATES. Australian J. Chem., 21(1):21-36, 1968. 17 refs.

Observations of the occurrence of metastable phases in the $BeSO_4$-H_2O system substantiated earlier findings relating to the $Zr(SO_4)_2$-H_2O system. The results provided further evidence that the formation of polymorphic compounds during thermal decomposition processes is controlled by the vapor pressure of the volatile component in the relevant region of the particular phase system. Metastable forms of $BeSO_4.2H_2O$ and $BeSO_4.H_2O$ may be observed during thermal decomposition of $BeSO_4.4H_2O$, their occurrence depending on the partial water vapor pressure in the immediate environment of the sample during decomposition. When the decomposition takes place in air at low external vapor pressure, their formation is influenced by any factors which affect the self-generated partial water vapor pressure. The vapor pressure existence range of metastable $BeSO_4.2H_2O$ was investigated. Anomalous effects observed when sulfuric acid solutions were used to provide fixed water vapor pressures during hydration and equilibration studies are attributed to the influence of the very low partial pressures of SO_3 (or H_2SO_4) over these solutions. The X-ray powder diffraction patterns of the equilibrium $BeSO_4.2H_2O$ and $BeSO_4.H_2O$ phases were indexed. (Author summary modified)

00067 104

I.V. Feigenbutz

THE COMPOSITION AND THERMODYNAMIC PROPERTIES FOR THE COMBUSTION PRODUCTS OF BERYLLIUM AND AIR. General Dynamics/Convair, San Diego, Calif., No. ERR-SD-128, June 1961, 30p.
CFSTI, DDC: AD 260268

The objective of this report is to present the ideal thermodynamic properties and composition for the combustion products of beryllium and air and to facilitate the performance calculation for a ramjet using beryllium as a fuel. The ideal thermodynamic properties and composition for the combustion products of beryllium and air were computed for assigned pressures from 0.000001 to 100 atm and temperatures from 1000 to 6000 K. The chemical species considered were gaseous N_2, N, NO, O_2, O, Be, BeO, $(BeO)_2$, $(BeO)_3$, $(BeO)_4$ and BeO (solid and liquid). The contribution from CO_2 and A in air were ignored. The composition of the reactants corresponds to 0.422 Be plus 0.2115 O2 plus 0.7885n2 in moles. The properties calculated are for an ideal mixture of pure gases, liquids, and solids. The thermodynamic properties are reported in table form and as a Mollier chart. The compositions are reported in chart form only. In addition, the boiling point, percent condensation of BeO, and the adiabatic flame temperature for various pressures are given. (Author)##

14754 105

Marchal, Germaine

RESEARCH ON THE DECOMPOSITION OF METALLIC SULFATES BY HEAT. DISSOCIATION OF MAGNESIUM AND BERYLLIUM SULFATES AND THEIR COMBINATIONS WITH POTASSIUM SULFATE. (Recherches sur la decomposition des sulfates metalliques par la chaleur. Dissociation des sulfates de magnesium, de glucinium et de leurs combinaisons avec le sulfate de potassium). Text in French. J. Chim. Phys., vol. 22:493-517, 1925. 26 refs.

The range of temperatures and pressures was measured from the beginning of the decomposition of magnesium sulfate at 880 to 1175 C. There was a break in the rise of temperature and pressure in the region of 1155-1165 C near the melting point. The melting point was shown to be 1155 C as determined in a special electric furnace. From the temperature-pressure diagrams, it was possible to calculate the partial pressures of sulfur trioxide, sulfur dioxide, and oxygen in the range 950 to 1190 C and the dissociation curve, temperature versus pressure. The reaction heat of decomposition varied from 71 cal between 1000 and 1050 C to 62.3 cal between 1084 and 1100 C. The same types of experiments were done for beryllium sulfate. Decomposition set in at 610 C and proceeded more rapidly at 700 C. Decomposition occurred according to the reaction: 5 BeSO4 yields SO3.5BeO + 4SO3. Again, a curve of pressure versus temperature was recorded between 590 and 830 C. The partial pressures of the gases (SO2, SO3, O2) given off in this range were also determined. The heat of decomposition averaged 41 cal. The double salt of magnesium and potassium sulfates was crystallized from pure single salts. Its melting point averaged 751 C.

16468 106

Sastri, M. N. and T. P. Prasad

THERMAL DECOMPOSITION OF BERYLLIUM SULPHATE TETRAHYDRATE. J. Inorg. Nucl. Chem., 30(6):1639-1640, July 1968. 8 refs.

The pyrolitic behavior of beryllium sulfate tetrahydrate was studied. Beryllium sulfate tetrahydrate was dried to a constant weight in a vacuum over a silica gel. About 250 mg was used for the thermogravimetric study. A thermobalance with a sensitivity of 1 mg, linear heating of 4 C/min, and a chart speed of 6 in./hr was used. The differential graph was drawn by plotting the weight loss/5 min against the temperature. The differential curve shows that the loss of water begins at 85 C with a maximum rate at 150 C. The weight loss between 85 and 200 C corresponded to 3.5 H2O. Between 200 and 300 C, the weight change was irregular and the total weight loss in that region was equivalent to 0.5 H2O. The anhydrous sulfate was stable between 330 and 600 C, and this was converted completely to the oxide at 850 C. The thermogram did not indicate the existence of any intermediate hydrate except perhaps an unstable hemihydrate in the 200-300 C region. No change in weight was indicated in the region where the anhydrous sulfate was present which was in contrast to the observation of Duval and Duval that the line was not absolutely horizontal. Further, conversion to the oxide was complete at 880 C as against 1031 C reported by them.

15775 107

Stuart, W. J. and T. L. Whateley

ADSORPTION OF WATER AND CARBON DIOXIDE ON BERYLLIUM OXIDE. Trans. Faraday Soc., vol. 61:2763-2771, 1965. 28 refs.

Infrared spectrophotometry was used to investigate adsorption of water and carbon dioxide on beryllium oxide. The spectra of adsorbed carbon dioxide were related to kinetic and isothermal data. At 25 C, water is physically adsorbed, and also chemisorbed, to form surface hydroxyl groups. Physically adsorbed molecules are desorbed by vacuum pumping at 25 C, but hydroxyl groups are completely removed only after heating at 550 C. Between 25 and 200 C, carbon dioxide is chemisorbed to form a simple surface carbonate ion, CO3(2-), and a bidentate carbonate species. Above 300 C, only the carbonate ion is formed. Kinetics of chemisorption are exactly described by the Elovich equation. The intensity of an infrared absorption band at 1580 reciprocal cm increases markedly when water, deuterium oxide, or carbon dioxide is chemisorbed. These increases are thought to be related to formation of defects near the surface. A shift in the frequency to 1550 reciprocal cm when water or methanol molecules are physically adsorbed is due to hydrogen bonding between these molecules and the surface hydroxyl groups. (Author abstract modified)

AUTHOR INDEX

A

Abe, S. *1

Anbar, M. *58

Arnest, R. T. *2

Aubrey, K. V. 44

B

Ball, K. E. 41

Bear, I. J. *103

Belyayera, L. N. *59

Bhandari, N. *12

Bird, L. S. 97

Bloodworth, M. E. 97

Blumenthal, J. L. *3

Bokowski, D. L. *22

Braman, R. S. *23, *24

Braverman, M. M. *25

Breslin, A. J. *48

Brewer, L. W. (ed.) *35

Brodovicz, B. A. *98

Brokeshoulder, S. F. 83

Bykhovskaya, M. S. *26

C

Carnuth, W. 16

Chambers, L. A. *27

Chase, F. R. *49

Cholak, J. 27, 42, *61, *60, *28

Clark, W. J. 97

Cohen, J. J. *62

Commins, B. T. *29, 44

Cooper, B. H. 43

Copper, W. C. 65

Cramer, H. E. *13

D

Darling, D. R. 97

Dattoli, J. A. 77

Deitch, D. 86

DeSanto, G. 13

Dieringer, L. F. *63

Dilts, R. L. *14

Donaldson, H. M. *64

Drozdova, V. M. *15

Durocher, N. L. *4

F

Falk, H. L. 72

Feigenbutz, L. V. 104

Feldstein, M. *30

Fotev, M. J. 27

Furon, D. 80

G

Gardner, W. J. 53

Preceding page blank

Gerarde, H. W. 76
Ghilarducci, H. E. 14
Goldmann, J. B. *5
Goldsmith, J. R. 101
Gopalakrishnan, S. 18
Gregory, A. R. *96
Guerrin, F. 80

H

Hamada, A. 6
Hamilton, H. 13
Hannon, J. W. G. *65
Hara, N. *6
Harris, R. L. *66
Hasenclever, D. *50
Heck, W. W. *97
Heimann, H. *67, *68
Herwig, L. C., Jr. *7
Higgins, F. B., Jr. 7
Higgins, G. M. 78
Hueper, W. C. *69

I

Inbar, M. 58
Iwashima, K. 45

J

Jirele, V. *51
Johnson, K. D. *70
Juskiewicz, A. *52
Just, J. *31

K

Karamzina, N. M. *71
Katz, M. *32, *99
Kehoe, R. A. 60, 61
Kendall, E. G. *53
Keenan, R. G. *33
Khukrin, E. V. *100
Kotin, P. *72
Kozlov, V. M. *73, *74
Krivoruchko, F. D. *34
Kusian, R. N. 62

L

Laamanen, A. 81
Lal, D. 12
Leadbeater, C. J. *75
Leduc, M. 80
Lehman, A. J. *76
Levy, B. M. *78
Lieben, J. *77
Lindberg, W. *79
Louw, C. W. *36

M

McClosky, J. P. *37
McGill, R. *8
McLouth, M. E. *54
McVean,, D. B. 83
Macquet, V. *80
Maga, J. A. *101
Marchal, G. *105
Marsh, V. 25
Martin, J. E., Jr. 65
Masciello, F. A. 25
Mazacek, J. 57
Maziarka, S. 31

Meyer, A. F., Jr. *55

Miller, L. H. 61

Mirarchi, A. O. 89

Mohilner, P. R. 38, 46

Monma, T. 45

Moorhead, J. 47

Morik, J. 39

Muller, R. H. *40

N

Nakamura, J. T. *41

Noro, L. *81

Noshkin, V. E. *9

Noweir, M. H. *42

Nozaki, K. 6

O

Okita, T. 45

P

Pinkerton, M. K. *82

Pirila, V. 81

Porter, M. B. 97

Potzl, K. *16

Prasad, T. P. 106

Princi, F. 61

Prindle, R. A. *17

Prine, J. R. *83

R

Rangarajan, C. *18

Reeves, A. L. *84, *85, *86, 87

Rihm, A. Jr., *102

Robinson, F. P. 83, *88

Robinson, L. H. 14

Rossano, A. T. *43

Roth, E. M. *89

Rowe, V. K. 76

S

Sakabe, H. 6

Santy, M. J. 3

Sastri, M. N. *106

Scarborough, G. C. 90

Schafer, L. J. 60, 61

Schaffner, F. 88

Schepers, G. W. H. 65

Sherwin, R. P. *90

Silva, D. G. *19

Skillern, C. P. 52

Smart, R. H. 90

Smith, H. F., Jr. 76

Smith, N. J. *91

Stevens, C. H. *56

Stocks, P. *44, *92

Stokinger, H. E. *93

Stuart, W. I. *107

Suzuki, T. *45

Svistov, P. F. 15

T

Taylor, J. H. *20

Teichner, W. H. 89

Terry, J. P. 54

Tessner, R. P. 91

Thomas, A. A. *94

Thomas, C. W. *21

Trachtenberg, E. 88

Turovskiy, V. D. 73, 74

V

Vasilieva, E. V. *95

Venezia, R. A. *10

Vorwald, A. J. 86, 87

Vought, V. M. 77

W

Waller, R. E. 29

West, P. W. 46

Whateley, T. L. 107

Wogman, N. A. 21

Wyszynska, H. 31

Z

Zahradnik, L. *57

Ziegler, R. F. 82

Zielinski, J. F. *11

Zweibaum, F. *47

TITLE INDEX

A

Absorption of Beryllium From the Gastrointestinal Tract 34

Adsorption of Water and Carbon Dioxide on Beryllium Oxide 107

Aerospace Toxicological Research 94

Air Pollution and Allergy 81

Air Pollution and Community Health (Chapter Eighteen) 17

Air Pollution Control at Cape Kennedy 54

Air Pollution Control in the Department of Defense 55

Air Pollution in Norway. II. Public Health Aspects of Air Pollution - A Literature Study 79

Air Quality Criteria for Beryllium and its Compounds 76

Air Quality Criteria for Pennsylvania 98

Analyses of Factors in Beryllium Associated Diseases 11

Analysis of Trace Metals in Biological Specimens by a Direct Reading Spectrometric Technique 91

Analytical Methods for Air Pollutants 30

Analytical Procedures for the Environmental Health Laboratory 35

Atmosphere Control in Closed Space Environment (Submarine) 2

Atmosphere Pollutants 72

Atmospheric Behavior of Airborne Radionuclides 21

Atmospheric Monitoring of Toxic Level of Missile Propellants 41

Atmospheric Pollutants and Their Analysis (Special Report Smog 2) 36

Atmospheric Transport of Rocket Motor Combustion By-Products 13

Atomic Absorption/Flame Emission Instrument Offers Versatile and Automated Operation 40

B

Beryllium 75

Beryllium, Actual and Potential Resources, Toxicity, and Properties in Relation to its Use in Propellants and Explosives 8

Beryllium Carcinogenesis: I. Inhalation Exposure of Rats to Beryllium Sulfate Aerosol 86

Beryllium Carcinogenesis: II. Pulmonary Deposition and Clearance of Inhaled Beryllium Sulfate in the Rat 87

Beryllium Concentration in the Air of Beryllium Alloy Handling Factory 6

Beryllium Disease 65

Beryllium Oxides of Propellant Fume: Our Knowledge of Their

Physico-Chemical and Toxicological Properties 70

Beryllium, Survey of the Literature 5

Beryllium, 1964-Toxicity and Handling 64

Beryllium: Toxicology, Clinical Aspects of Diseases, Labor Hygiene 73

Beryllium Toxicology, Symtomatology of Affections and Industrial Hygiene 74

C

Characteristics of the Clinical Course of Pneumonia Related to Beryllium Compound Poisoning 59

Chemical Aspects of Environmental Health 33

Chronic Berylliosis and Calcospherite Deposition 90

Comparative Evaluation of Some Methods for the Determination of Beryllium and its Compounds Applicable to Air Analysis 26

Comparison of Particulate Loadings in the Atmospheres of Certain American Cities 27

Composition and Thermodynamic Properties for the Combustion Products of Beryllium and Air 104

Contaminants Standards. (Section 13.) In: Compendium of Human Responses to the Aerospace Environment, Volume III, Sections 10-16. 89

Contents of Some Microelements in Atmospheric Precipitations 15

Control of Air Pollution From Federal Facilities 10

Control of Beryllium During Impact Tests 52

D

Demonstration of the Presence of Beryllium in Pulmonary Granulomas 83

Design, Construction, and Operation of the Aerospace Corporation Beryllium Toxic Materials Laboratory 53

Diffusion Bibliography. Los Angeles Air Force Station California 19

Dust Collection Pays its Way 49

Dust Hazards Related to Health 66

E

Effect of Beryllium Oxide and Beryllium Alloys With Alloys With Aluminum on Glycolysis in the Lung 71

Effect of Certain Metallic Cations on the Iodide Uptake in the Thyroid Gland of Mice 58

Effects of Air Pollution on Edible Crops 96

Effects of Air Pollution on Human Health 67

Effects of Beryllium Sulfate on Serum Alkaline Phosphatase in Primates 82

Environmental Engineering in Handling Toxic Materials 56

Environmental and Occupational Cancer Hazards. Part I of Symposium: Chemical Carcinogenesis 69

Environmental Pollution by Missile Propellants 97

Estimation of Beryllium With Eriochrome Cyanine R Using the Ring Oven Technique 46

Experimental Investigation of the Behavior of

Beryllium Metal in Simulated Launch Pad About Environments 3

Extraction of Beryllium From Power Plant Waste Material 51

F

Fallout Radion Nuclides and Beryllium-7 in Over-Ocean Aerosols 9

Further Observation on the Occurrence of Metastable Phases During Thermal Decomposition of Sulphates 103

H

Health Control Program in a Beryllium Facility: 3 Years Experience 63

I

Immunological Assessment of a Model of Experimental Berylliosis 95

Isozymes of Lactate Dehydrogenase During Beryllium, Carcinogenesis in the Rat 85

M

Measurement of Air Pollution in Hungarian Industrial Centers 39

Modern Approach to Air Dustiness in Workshops 100

Monitoring of Environmental Dispersion of Beryllium From Disposal of a Solid Propellant by Trench Burning at Dugway Proving Ground, Utah 7

Multi-Element Atomic Absorption Analyzer 47

N

Nature of Atmospheric Pollution in a Number of Industrial Communities 28

New York State's Classification Ambient Air Quality Objectives System 102

O

Observations From a Ten-Year-Study of Pollution at a Site in the City of London 29

Obtaining Trace and Rare Elements From Power Plant Fly Ash 57

P

Photometric Determination of Beryllium in Air by Means of Chlorophosphonazo R 34

Preliminary Air Pollution Survey of Beryllium and its Compounds: A Literature Review 4

Present Status of Air Pollution 1

Project Sand Storm-an Experimental Program in Atmospheric Diffusion 20

Q

Quality Standards for Air and Water 99

R

Rapid Determination of Beryllium by a Direct Reading Atomic Absorption Spectrophotometer 22

Reations Within the Lungs of Guinea Pigs to the Intratracheal Administration of Zinc Beryllium Silicate 78

Relations Between Atmospheric Pollution in Urban and Rural Localities and Mortality From Cancer, Bronchitis and Pneumonia, With Particular Reference to 3:4 Benzopyrene,

SUBJECT INDEX

A

Absorption 22, 84

Adsorption 107

Aerosols 9

Aerospace 94

Airborne Dust 24, 42

Air-Borne Particulates 25

Air Quality 102

Air Quality Criteria 76, 98, 101

Air Quality Standards 99, 101

Allergy 81

American Cities 27

Analysis Colorimetrically 45

Analytical Methods 22, 30

Analytical Procedures 35

Atmospheric Aerosols 31

Atmospheric Diffusion 20

Atmospheric Movements 21

Atmospheric Precipitation 15

Atomic Absorption 40

Automatic Monitor 23, 24

Autopsy 90

B

Beryllium Alloy 6

Beryllium-Aluminum Alloy 71

Beryllium Disease 61, 64, 65, 83, 92

Beryllium Disease, Acute 65

Beryllium Disease, Acute and Cronic 76

Beryllium Disease Chronic 88

Beryllium Facility 63

Beryllium Metals 3

Beryllium Oxides 70, 107

Beryllium Particles 52

Beryllium Propellant 60

Beryllium Sulfate 82, 105, 106

Beryllium Zinc Silicate 78

Berylliosis 4, 64, 75, 77, 95

Berylliosis Acute 65

Berylliosis, Chronic 90

Bibliography (Beryllium) 19

Biological Materials 33, 42

Biological Specimens 91

C

Caesium 137, 18

Cancer 69, 92

Cape Kennedy 54

Carcinogenesis 85, 86, 87

Chromatography, Paper 26

Closed Space Environment 2

Color Reaction 38

Colorimetric Determination 26
Combustion 13
Combustion Products 104
Community Health 17
Concentrations 6, 21, 23, 84
Cosmic Ray 18

D

Decomposition 105
Dermatitis 64
Diffusion 13, 14
Diffusion (Beryllium) 7
Dust 88, 100
Dust Collection 49
Dust Control Equipment 56
Dust Hazards 66

E

Emission Spectroscopy 83
Environmental Dispersion 7
Episodes 17, 67, 72, 79
Eriochrome Cyanine R 38, 46
Evaluation of Methods 26

F

Fallout 9
Federal Facilities 10
Filters 50
Filtration Collector 56
Fly Ash 57

G

Gas Chromatography 42
Gastrointestinal Tract 84

H

Health Effects 77
Health Research 68

I

Immunology 95
Impact Test 52
Industrial Aerosols 100
Industrial Center 39
Industrial Communities
Industrial Hygiene 74
Inhalation Exposure 86

L

Laser Microprobe 83
Lawrence Radiation Lab. 62

Literature Survey (Beryllium) 4, 5, 79

M

Maximum Allowable Concentrations - (MAC) 2, 11, 81
Measurement Methods 13, 26
Metal Ions 58
Metallic Cations 58
Metallic Sulfates 58
Metastable Phases 103
Microdetermination 46
Microelements 15
Missile Industry 41
Missile Propellant 97
Monitoring 47
Morbidity and Mortality 32, 72

Mortality 92

N

Nuclei 16

O

Occupational Diseases 11

Occupational Health 63

P

Particulate Material 27

Photometric Methods 34

Physical Environments 11

Plant Damage 96

Pneumoconioses 66

Pneumonia 59

Pollution Episodes 17

Power Plant 51

Propellant and Explosive 8

Propellant Fumes 70

Pulmonary Berylliosis, Chronic 80

Pulmonary Deposition 87

Pulmonary Tumors 85

R

Radioactive 21

Radioactive Fall out 16

Radioactive Tracer 12, 58

Radioactivity 9

Radioisotopes 16

Radionuclides 9

Reaction 25, 34, 78

Reaction Kinetics 3

Respiratory Illness 75

Ring Oven Technique 46

Rocket Motor 13

S

Sampling 21, 48

Sampling Analysis 27

Seasonal Variations 18

Skin Reaction 75, 95

Soft Coal 51

Space Cabin 89

Spectrographic Methods 26, 92

Spectrometric Technique 91

Spectrophotometry 22, 37, 38, 107

Spot Test 38

Surface Contamination 62

T

Thermal Decomposition 25, 103, 106

Thermodynamic Properties 104

Thyroid Gland 58

Toxic Exhaust 14

Toxic Hazards 60

Toxic, Materials 49, 53, 56

Toxic Materials Laboratory 53

Toxic Propellants 54

Toxicity 61, 62, 64, 76

Toxicology 2, 8, 30, 41, 55, 59, 64, 70, 73, 74, 93, 94, 96

Trace Analysis 25

Trace Elements 44

Trace Metals 45, 91

Tumors 86

U

Urine 77

X

X-Ray Diffraction

GEOGRAPHIC LOCATION INDEX

United States (States, Cities)

California 100
  Los Angeles 20

Florida
  Cape Kennedy 54

Michigan
  Detroit 32

New York State 102
  New York City 40

Ohio
  Cincinnati 28

Pennsylvania 56, 98

U. S. A. 99

Utah
  Dugway Proving Ground 7

Foreign (Countries, Cities)

Czechoslovakia 51, 99

England 44
  London 29

Finland 81

Germany 50, 99

Hungary 39

India
  Bombay 18

Japan 1, 6, 45

Norway 79

Poland 31

South Africa 36

U.S.S.R. 15, 99

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